

ADVANCED ELECTRICAL PROTECTION

Selection Guide



ABOUT CROUZET

Crouzet is an independent company manufacturing mechatronic components for demanding applications in Aerospace & Transportation, Energy, Building and Machinery Industry.

Crouzet provides **Switches and Sensors, Electromechanical Actuators, Electrical Protection Equipment, Cockpit Controls, Automation Controllers and Relays, and Instrumentation Services.**

Since 1921, Crouzet has a heritage of close collaboration with customers in the development of products, from standard components to fully customized solutions.

Crouzet's customers and partners can rely on our teams worldwide to always meet and often exceed their expectations. Driven by innovation, our experts are focused on designing and delivering the right product for the right application.

Crouzet is your trusted partner of choice to face industrial challenges of today and tomorrow.

WORLDWIDE PRESENCE



📍 HEADQUARTERS

■ SALES OFFICES

CONTENTS

	Pages
Wire & structure & fuel tank protection _____	6
Wire & human & fuel tank protection _____	6
High Shock and Vibration Breakers _____	10
From SSCB to SSPC _____	10
Circuit Breaker panels _____	10
The «do it your self» kit _____	10
Remote Control Contactor & Circuit Breaker _____	10

ELECTRICAL PROTECTION

Selection Guide (Choice by standard and ratings) _____	16
Small Model Circuit Breaker Single Pole _____	18
Small Model Circuit Breaker Three Pole _____	20
Big Model Circuit Breaker Single Pole _____	22
Big Model Circuit Breaker Three Pole _____	24
Frog legs Terminals _____	26
Push-pull Push-fit 6.35 mm Blade _____	28
Push-push & Flying Leads Version _____	30
GFCB & AFCB _____	32
Dummy & Watertight Push Button CB _____	34
Accessories _____	36

ELECTRICAL DISTRIBUTION

Wire & load protection _____	37
Panel kit for Faston CB _____	38
RCCB 115/200 VAC 360-800 Hz _____	40

WIRE PROTECTION

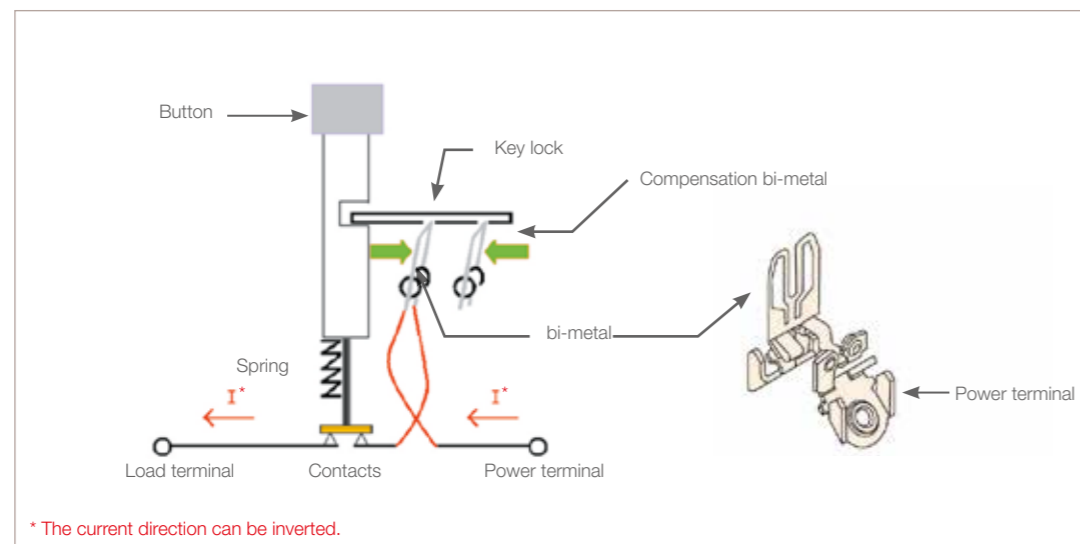
HOW DOES IT WORK?

ELECTROMECHANICAL CIRCUIT BREAKERS

In this type of Circuit Breaker, the current sensing is done by a bi-metal. The bi-metal is also part of the actuator that will open the line: the bi-metal is bent by heat coming from the current, the bi-metal moves the key lock, releases the latch and opens the line.

The Circuit Breaker bi-metal bends and releases the latch according to the overload current value and the overload duration (the bending is independant of the current direction).

If any, the auxiliary contact are galvanically isolated from the power and gives the state of the contacts (open or closed).



«LIGHT, SIMPLE AND SAFE»

Light:

Our single phase EN2495 and MIL MS33201 V compliant model is the lightest in the world (<20 g with screws, washers and nut).

Simple:

- › Designed to be reused several times, spare components are not required
- › Can sometimes be used as a switch (within the defined endurance limits), they therefore perform a dual function of switching and protecting

Safe:

- › Our intrinsic fail safe** and trip free* conception enable a high level of safety (generally 10⁻⁹ Flight Hours (FH) of not opening on a short circuit)
- › The temperature compensation ensures high performance over a wide temperature range (usually -60°C to +125°C)
- › Excellent resistance to mechanical stress
- › High current level peaks and high current flows tolerance

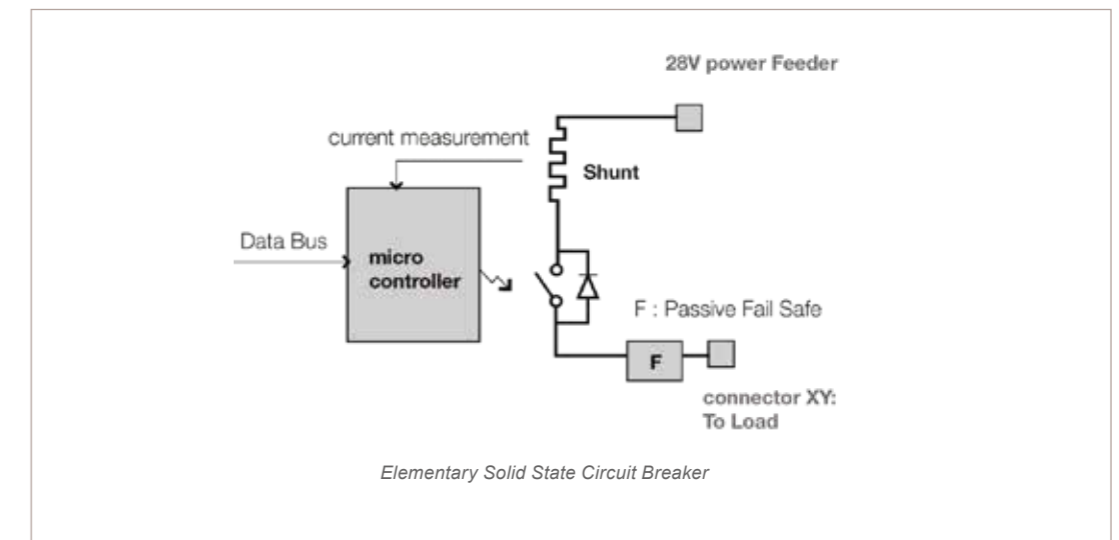
* **Trip free**: even if the pushbutton is maintained in the closed position, the opening of the contacts (and therefore of the electric circuit) is ensured in the event of a current surge or short-circuit.

** **Intrinsic safety (Fail safe)**: the Circuit Breaker has been designed with a fuse element to ensure that the electric circuit is opened in the extreme case of a blocked mechanism or glued contacts.

SOLID STATE CIRCUIT BREAKERS (SSCB)

In this type of Circuit Breaker, the current sensing is done by a shunt or a Hall sensor in DC or a Current Transformer (CT) in AC. A microcontroller or FPGA acquires the current and simulates the i^2t curve, the switch function is often done by MOSFETS, bipolar transistors, SCR (i.e. thyristors).

The microcontroller will integrate the current going through the shunt and will open the MOSFET according to the current value and overload duration.



The patented fuse **F** gives a 10⁻⁹ FH safety level (equivalent to mechanical Circuit Breakers) and still gives the possibility of reprogramming the Rated Current value by software.

«MORE THAN A THERMAL SWITCH»

A SSCB is more than a thermal switch because when it is connected to a data bus, it provides intrinsically functions such as:

- › A remote switching ability (useful in application: contactor or relay function)
- › Dimmer or chopper function (useful in applications such as: motor speed control, light dimming, soft start)
- › Current monitoring (prognostic applications, load failure detection)

Also,

- › They are not susceptible to vibrations (useful in applications with high acceleration (Gs): aircraft, guns...)
- › They generate no audio noise (useful in applications such as: submarines, electric tanks, medical...)
- › The micro controller can run the arc fault protection algorithm
- › They can become a PLD with a protected power output (see p. 37)
- › They can protect the load (see p. 37).

WIRE & STRUCTURE & FUEL TANK PROTECTION

ARC FAULT DETECTION

EWIS PROTECTION

The 14CFR Part 25 subpart H requirements asks aircraft OEM to consider the electrical wiring interconnection as a system. This means that the airworthiness of the wiring must be guaranteed for the complete lifetime of the aircraft.

AFCBs are a way to obtain compliancy to AC 25 1701-1.

The Advisory Circular (AC 251701-1) gives guidance for subpart H compliancy and indicates that a safety analysis of the Electric Wiring Interconnection Systems (EWIS) has to be done.

To certify the EWIS, the constructor must show a proactive approach to mitigate risks and perform a zonal analysis (EZAP).

When performing this analysis, it is very important to keep in mind that «regardless of probability, any single arcing failure should be assumed for any power carrying line» (page 31 of the AC) because the traditional way of thinking which was: «optional systems, like in flight entertainment, cannot cause a catastrophic failure condition» is not a valid assumption.

Locations where arcing must be mitigated:

- A** In flight entertainment area
- B** Cargo and baggage compartment door actuators
- C** Fuel tanks
- D** SWAMP area (Severe Wind And Moisture Problem area) such as wires in landing gear well or cockpit window heater or wing defrost heaters
- E** Galleys to protect electrical socket appliances such as: Cooktop ovens, waste compacting machines, coffee machines etc...
- F** Places where due to vibration, heat, aging or after an incorrect maintenance operation there is a risk of a power line touching:
 1. a critical hydraulic actuator line
 2. pressurized air line (air duct) or flight critical data line
 3. mechanical control system cable
 4. oxygen lines
 5. fuel lines
 6. water and water/waste line (and below them in case of dripping)
 7. hot air ducts

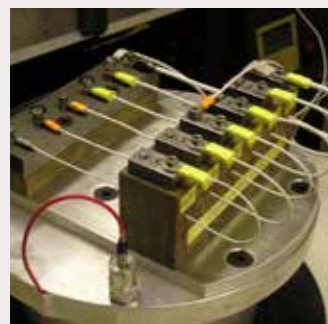
In case of an arc inside a bundle, arc fault technology will preclude a chain reaction in the bundle from inducing the loss of the complete bundle. Instead there will be a «controlled» deterioration of the wire(s) giving time for maintenance to be aware of the fault (by using the information coming from the circuit breaker) and thus avoiding a potential catastrophic situation.



Wet arc



Parallel arc



Series arc

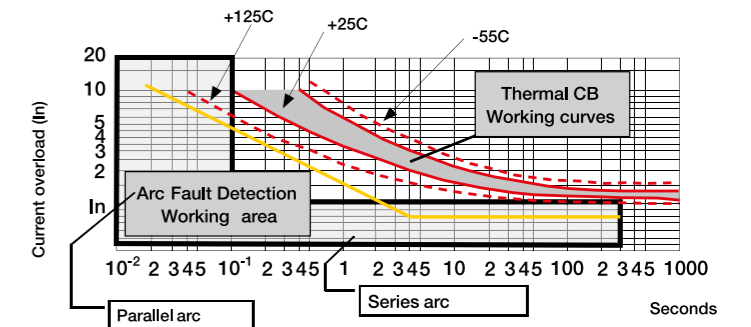
HOW DOES ARC FAULT PROTECTION WORK?

AFCBs combine the safety of standard Circuit Breakers and high accuracy electronics to mitigate arcing. Each standard thermal Circuit Breaker is equipped with an electronic board in order to analyze the current waveform in real time to detect if arcing is occurring.



Single pole AFCB

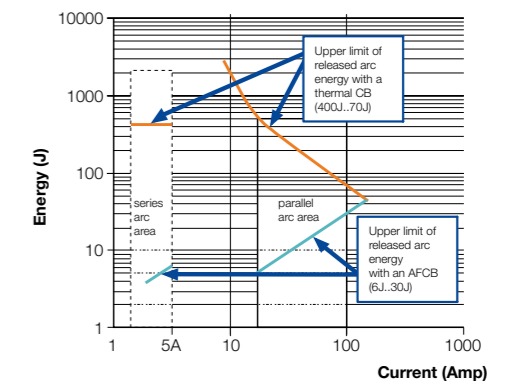
The algorithm in the electric board works faster than the thermal bi-metal function as shown on the adjacent chart.



ARC FAULT WILL CLEAR THE FAULT FASTER THAN THERMAL PROTECTION

In case of an electric hazard, the arcing energy (thus mechanical damage) is divided by a magnitude (generally 10) as shown in the adjacent chart.

The quick opening time of the GFCB-AFCB (generally 12 msec) will not release sufficient energy to puncture the conduit or the tank's skin (a pure thermal circuit breaker will open on an arc or a shorting current in 200 ms, thus 10 times slower which releases sufficient energy to puncture the tank's skin or conduit).



CARBON COMPOSITE (CFRP) PROTECTION

Carbon Fibres Reinforced Polymer (CFRP) can be damaged (delamination) and can ignite in case of arcing. The use of arc fault protection will mitigate damage and risk significantly as illustrated below:



230 VAC Fault with arc fault protection: only cosmetic damages appears

Cosmetic damage



Delamination

230 VAC Fault without arc fault protection: delamination of the fibers

WIRE & HUMAN & FUEL TANK PROTECTION

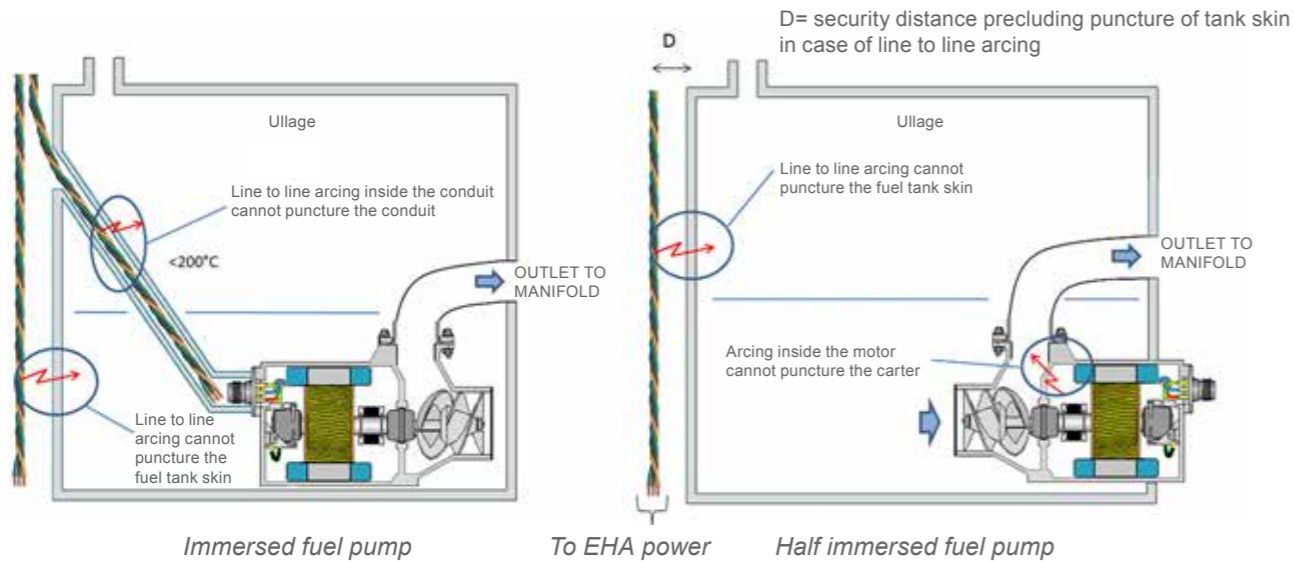
GROUND FAULT CIRCUIT BREAKER (GFCB) WITH ARC FAULT

FUEL TANK PROTECTION

Following SFAR88 recommendation, the FAA and EASA have compelled PART 25 aircrafts to protect fuel tanks with Ground Fault. The purpose of these Ground Fault protection device is to preclude fuel tank puncture by reducing drastically the amount energy liberated by a fault.

Documents **AC25981** and **AMC25981(a)** state that:

«any components located in or adjacent to a fuel tank must be qualified to meet standards that assure, during both normal and failure conditions, ignition of flammable fluid vapors will not occur».



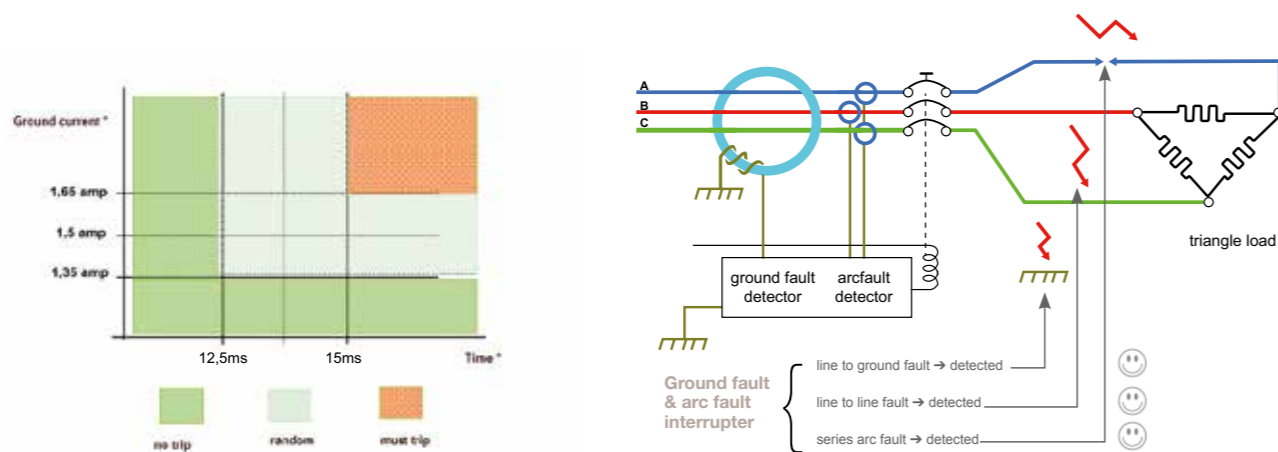
The reduction of damage concerns also:

- › Pylons & nacelles and small dimension aircraft where power line are routed near data buses or hydraulic tubes.
- › Wings where torque tube disconnections can cause severe damage to the wiring.
- › Composite wings with high power electric actuators (EHA, EBHA) in the vicinity of fuel tanks.

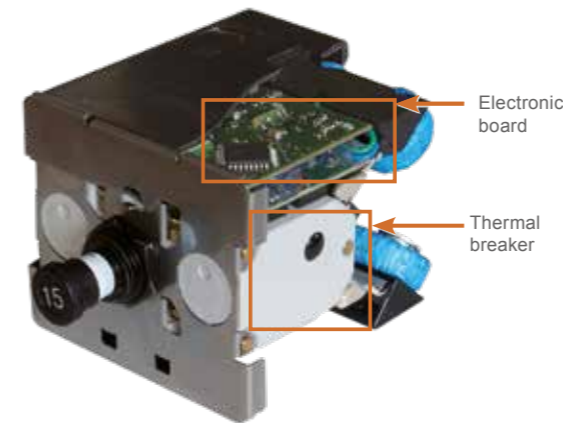
THE GF-AFCB: A GFI CAPTURING LINE TO LINE ARCING

Traditional Ground Fault protection do not capture series arcing or line to line arcing because these two faults do not create a leakage current to the ground (i.e. the CT that measures the homopolar current will still read «zero» with one of these 2 faults occurring). By adding arc fault detection on each line, the GF-AFCB is a GFI and a circuit breaker that detects these 2 wire faults.

THE GF-AFCB STRUCTURE



ARC FAULT INTERRUPTER



HOW DOES IT WORK?

› Built in test

The GF-AFCB provides built-in test features that allow aircraft maintenance personal to verify that ground fault protection is functional, or that a ground fault has occurred: data issued from the led on the flat of the threaded barrel gives this information.

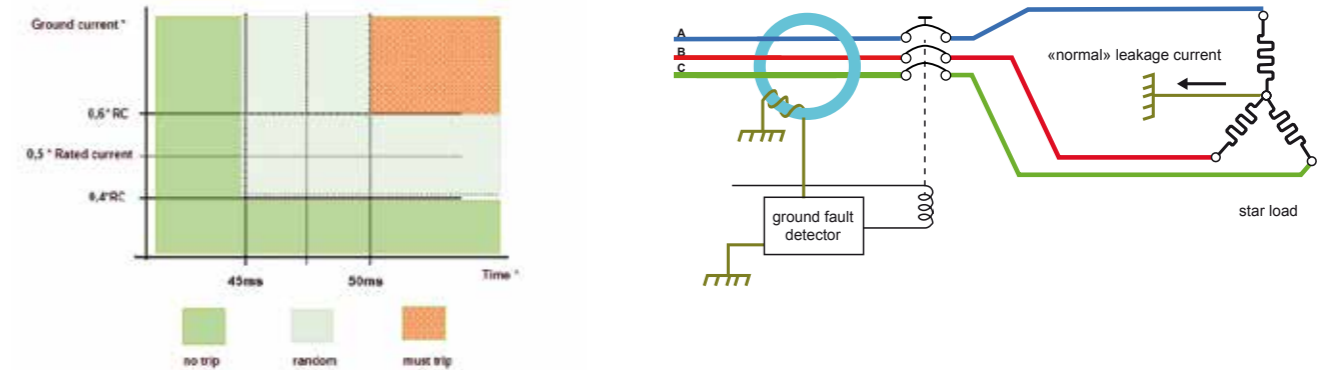
› Severed wire detection

The GF-AFCB includes «severed wire detection» (ie broken or cut wire) to preclude the heating of a motor if it is stalled (blocked) or running on only 2 phase (typical time detection is 1 second).

The above has been implemented because **AC25981 states page 9.3.1:**

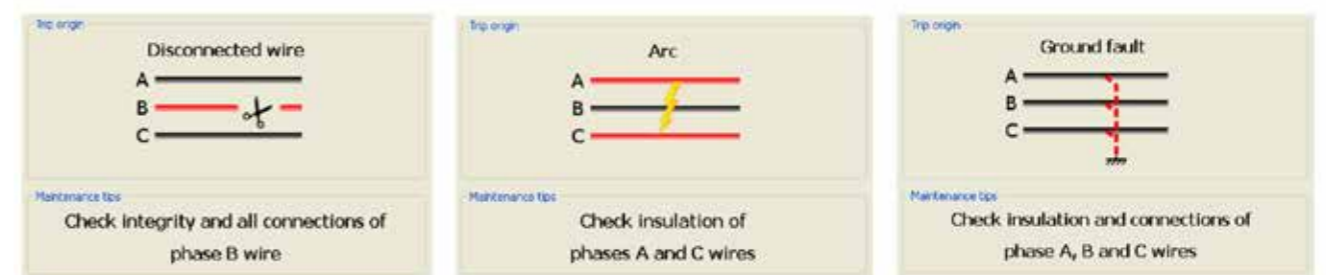
(c) «[...] Automatic protective means, such as arc/ground fault interrupters or other means, should be provided to shut down the pump when a single electrical phase failure occurs. Periodic inspections or maintenance of these features may be required».

ON A «STAR» (WYE) LOAD, WITH GROUNDED CENTER, THE BEHAVIOR OF THE GFCB IS THE FOLLOWING



TROUBLE SHOOTING THE WIRE WITH INFORMATION FROM THE BREAKER READER

The following pictures are screenshots of the laptop running the breaker reader software after a fault has occurred.



ELECTRICAL PROTECTION

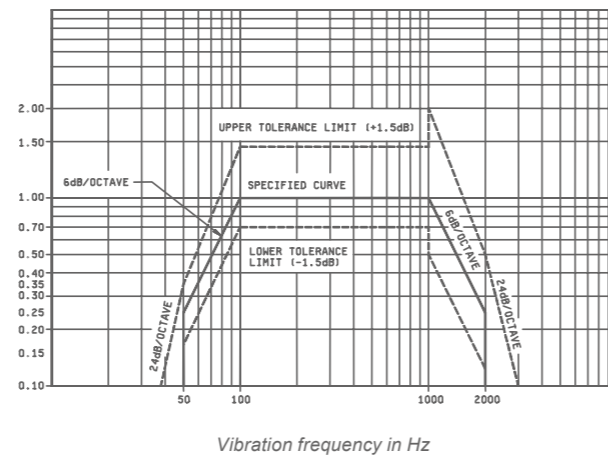
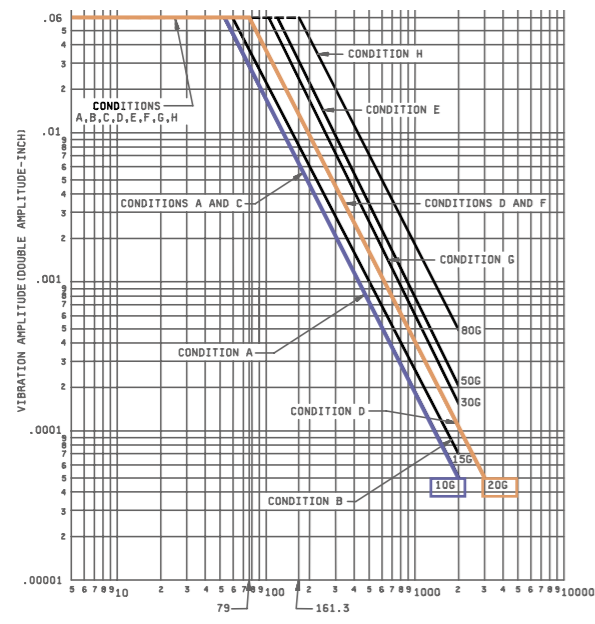
HIGH SHOCK AND VIBRATION BREAKERS

Our High-Performance Thermal Circuit Breakers exceed the standard for shock and vibration for military applications.

It has always been troublesome for electrical systems engineers to find the best suitable circuit breakers for harsh environments. Crouzet has developed a specific series of circuit breakers which go far beyond the current standards.

When used in the vicinity of cannons or missile launchers and in circuit breaker panels installed next to machine guns (e.g. helicopters, jet fighters or armored vehicles) the high «shock and vibration» family avoids installing silent blocs on panels or on circuit breakers (while maintaining top circuit protection performance).

For the single pole circuit breaker the High Shock and Vibration products multiply by two the endurance level to random and sinus vibrations, compared to AS58091 level or basic MS33201 levels.



Test condition letter	Power spectral density	Overall rms G
A	.02	5.35
B	.04	7.56
C	.06	9.26
D	.1	11.95
E	.2	16.91
F	.3	20.71

Sinusoidal (MIL STD 202 method 204 D)	20 g-PK: condition D under 71 °C and RC
Random (MIL STD 202 method 214 A)	16.91 Grms: condition G under 71° C and RC
Shock (MIL STD 202 method 213B)	75 g 3 halfsine 6 msec: condition B



Typical circuit protection on following military platforms:

- › Fighter Aircraft
- › Military Helicopters
- › Ground Air Defense Systems
- › Military Land Tracked and Wheeled Vehicles
- › Missile Launchers
- › Naval Shipboard Applications

ELECTRICAL DISTRIBUTION

FROM SSCB TO SSPC

FROM SSCB TO SSPC

Using the most recent solid state technology, Crouzet has developed 2 generic Solid State Circuit Breakers (SSCB): One for 28 VDC applications, the other for 115 VAC applications.

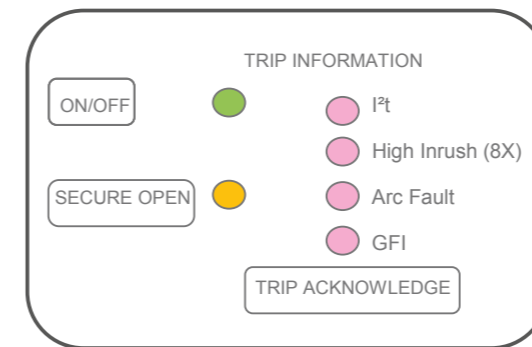
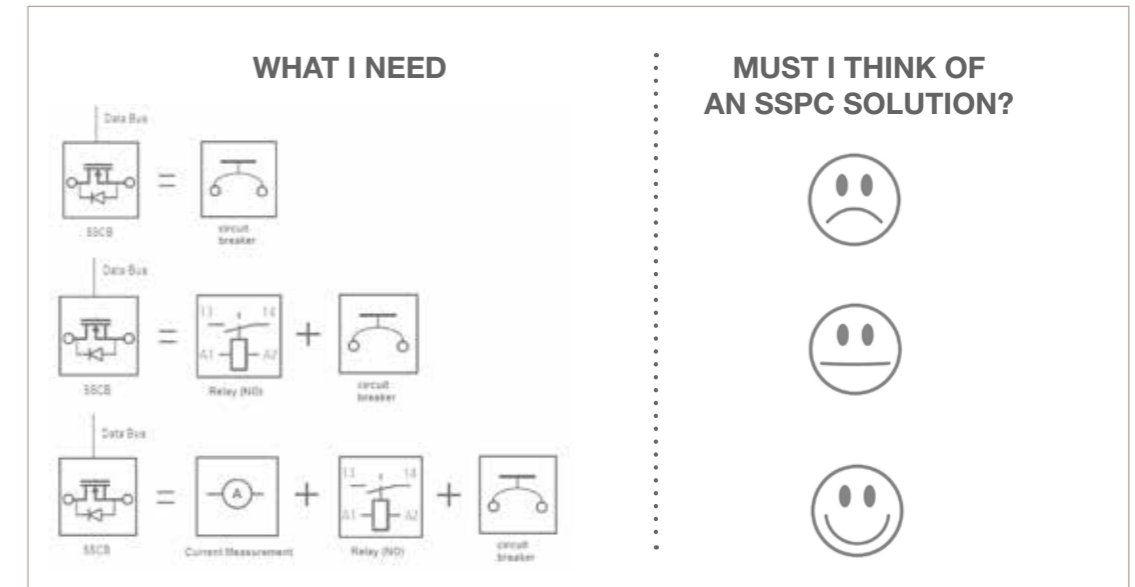
A Solid State Circuit Breaker is composed of a microcontroller, a switch and a data bus.

This enables a SSCB to provide more than just thermal protection; its role encompasses electrical functions such as: relay, gradator, chopper, ground fault, soft start, current measurement.

These functions can be used for light dimming, motor speed control, intermittent load command (on/off), inrush current limitation, sequential power ON of loads, load failure detection. This is why they become Solid State Power Controllers (SSPC).

WHEN DO I NEED A SSPC?

Cost efficiency will depend on the ability to encompass several of the previous functions. When thinking of an SSPC solution the following chart must be kept in mind:



Laptop-tablet interface

EASY TO OPERATE

Both 115 VAC and 28 VDC SSPC components are delivered with a laptop/tablet interface that enables a quick appropriation of SSPC features. Command from the laptop are transferred through CAN bus. The laptop/tablet interface can be replaced by a MCU or Utilities Management System (UMS) that sends and receives data frames through CAN2.0B.

The typical set of orders/queries is:

- ON/OFF** : Powers ON/OFF the load
- RESET** : RESETS the elementary switch after arc or thermal trip
- STATUS** : Asks for trip reason
- CURRENT** : Asks for current (A) value
- BACKUP** : Programs the behavior when data bus is disconnected

ELECTRICAL DISTRIBUTION

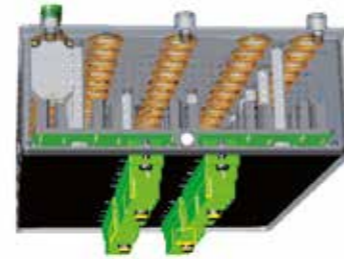
CIRCUIT BREAKER PANELS

SUPPLIER OF CIRCUIT BREAKER PANELS ON SEVERAL JET AND HELICOPTER PROGRAMS

Crouzet has extensive experience in the design, development and production of illuminated and non-illuminated Circuit Breaker panels in Push/Pull or Push/Push versions, wire or PCB-FASTON version.



100 CB regional jet panel
(wire + casing)

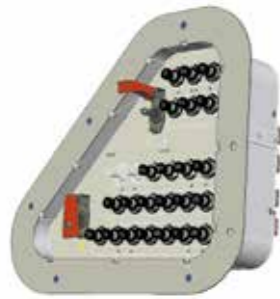


55 CB search and rescue helicopter panel
(PCB + casing)

OUR KNOW HOW

As a manufacturer of CB panels we will optimise your needs:

- › Geometry, connection and mounting as specified by your requirements and constraints
- › Customised marking of the front panel
- › Labelling of Circuit Breaker functions by engraving or easily-modified labels
- › Reduced weight due in part to our specially developed light weight Circuit Breaker and busbars
- › Expertise in mechanical and thermal limits (wire gauges, suitable sizes for Circuit Breakers, optimum distribution of Circuit Breaker, ...)
- › Expertise in busbars and connections with all the safety requirements (segregation, protection, ...)
- › ATP performed by automatic test benches

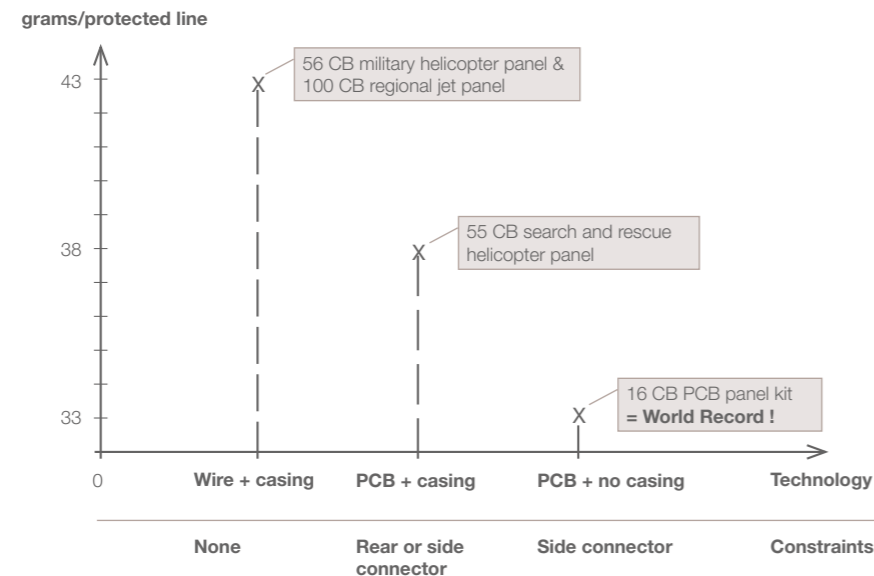


25 CB offshore helicopter panel
(wire +casing)



56 CB military helicopter panel
(PCB + casing)

PREDICTABLE PANEL MASS FOR PANELS CONTAINING ONLY CBs



ELECTRICAL DISTRIBUTION

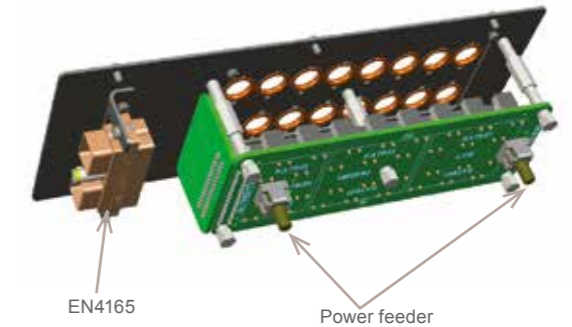
THE «DO IT YOUR SELF» KIT & BUS BARS

THE KIT:

Crouzet is the first company to invent the concept of «do it yourself» Circuit Breaker panels and with this technique, it has created the **lightest extractible Circuit Breaker panel in the world!** The concept is based on a generic PWB carrying 16 Push Fit CBs that you can duplicate (if several bus bars are needed or if more Circuit Breakers are needed).



The «Do it your self» kit



KIT CONSTITUTION

The kit is composed of spacers, a PCB board, FASTON Circuit Breakers, and positioning rings. The front plate is compatible with accessories (Circuit Breaker gags and obturators).

WORLD RECORD

The above kit assembly conveys 150 A at 71°C, it weighs 528 g with 16 Circuit Breakers and thus gives a panel efficiency ratio of 528 g=33g/CB → a world record!

PREQUALIFICATION

To reduce development time the kit is qualified to harsh environment.

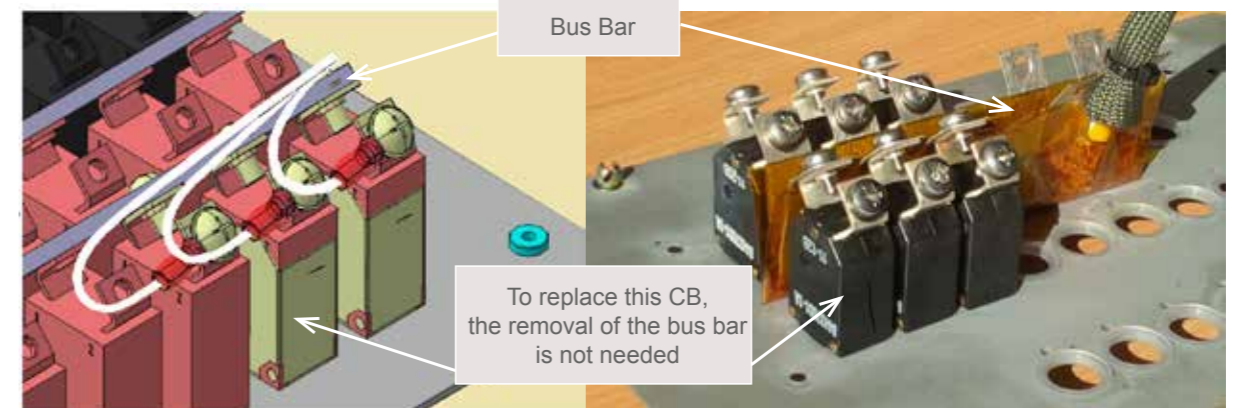
The use of the panel or its sub-sets enables the quick fielding of a qualified solution. If the assembly recommendation and Circuit Breaker locations are respected, Crouzet guarantees the electrical and vibrational behavior of the kit:

- › Temperature and electrically from -55°C to 71°C with a 100% utility factor (150 A output)
- › Vibrations: Random and Sinusoidal rays (Harsh Helicopter Level)
- › Crash, fungus, sand and dust.

BUS BARS:

Traditional bus bar (rectangular)

Crouzet bus bar (flexible)



Use of frog legs CB (45° or 60°) is necessary

The flexible bus bar is compatible of many CB families

ELECTRICAL DISTRIBUTION

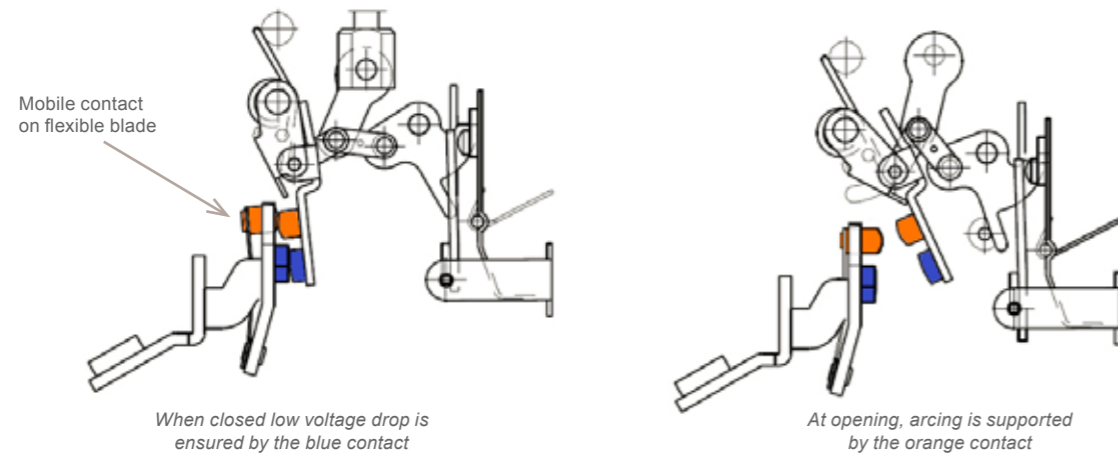
REMOTE CONTROL CONTACTOR & CIRCUIT BREAKER

The RCCB's primary use is to power loads that do not need to be permanently ON (to optimize energy). This is why it is used:

- › For powering hydraulic actuators of cargo bay doors
- › For powering Electro Hydraulic Actuators (EHA) and Electro Backup Hydraulic Actuators (EBHA)
- › For powering ON and OFF the galleys or In Flight Entertainment (IFE)

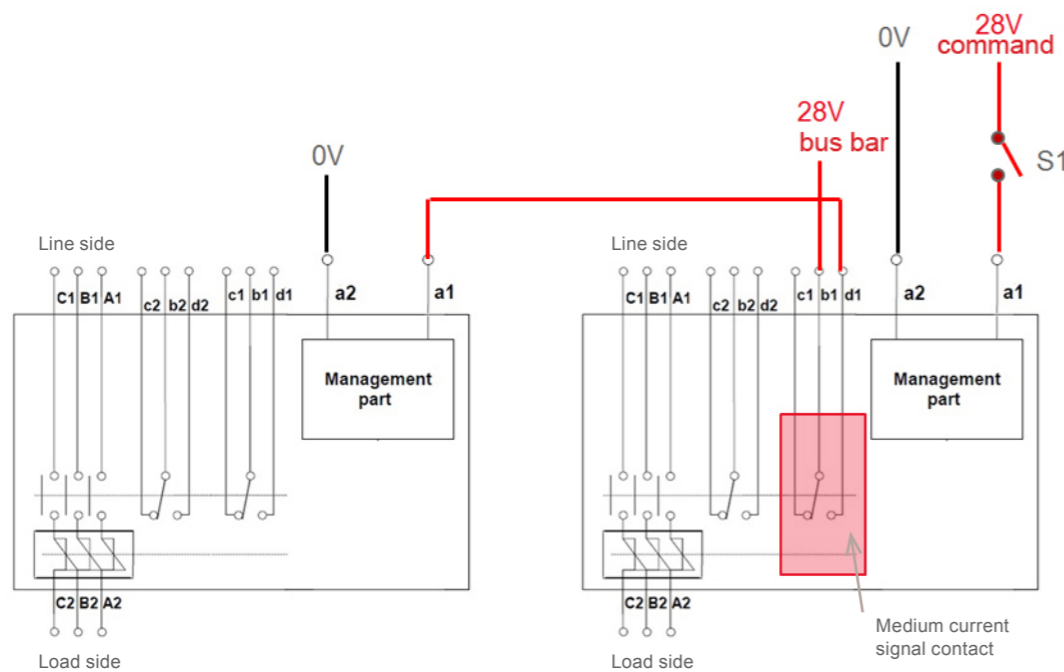
The RCCB contacts are CLOSED and OPENED (load is set ON and OFF) only once or twice during the flight; it is designed to commute at least 100,000 times, giving the aircraft a minimum of 50,000 cycles (take off and landing).

- › A unique feature: a mobile contact (in orange) that closes first and opens last ; this contact rich in tungsten endures rebound at closing time and arcing at opening time. The blue contact rich in silver ensures a low voltage drop during steady state operation ; this association guarantees 100 000 cycles under rated current with a power factor of 0.7.



- › A unique feature: a signal contact withstanding «medium» current:

Using c1 b1 d1 «medium current signal contacts» it is possible to command 2 RCCBs with only one switch (here switch S1) :



The RCCB merges a contactor function and a circuit breaker function in a single unit. The contactor is closed when 28 V is applied on the command input. The RCCB has a status display window and a mechanical «TRIP indicator».

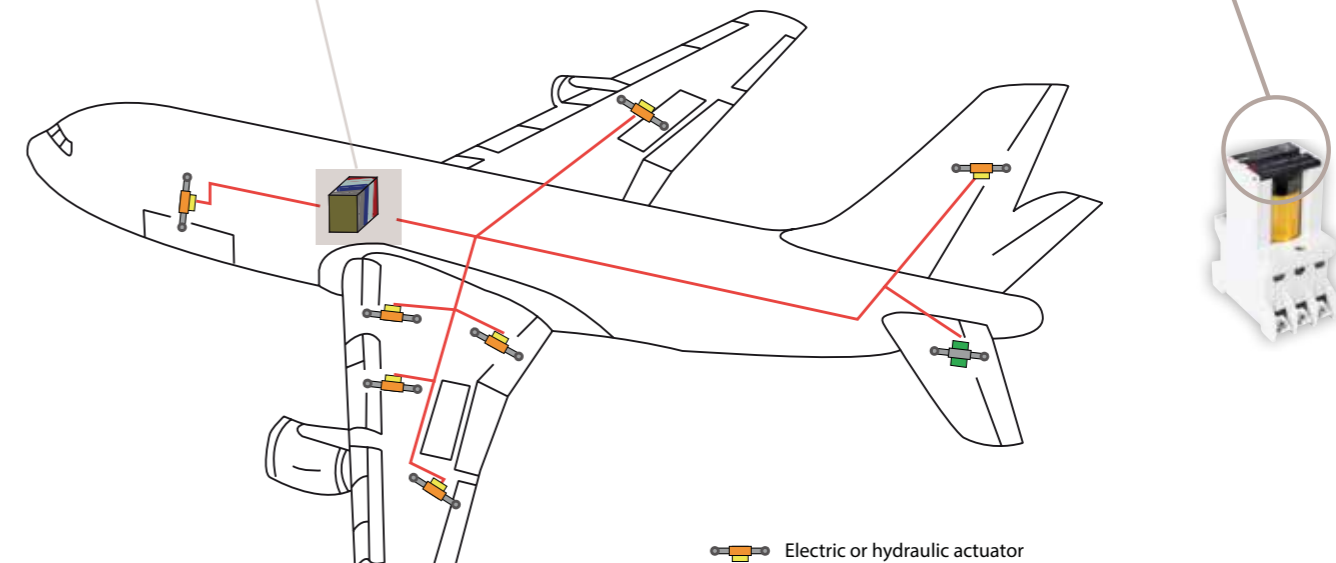
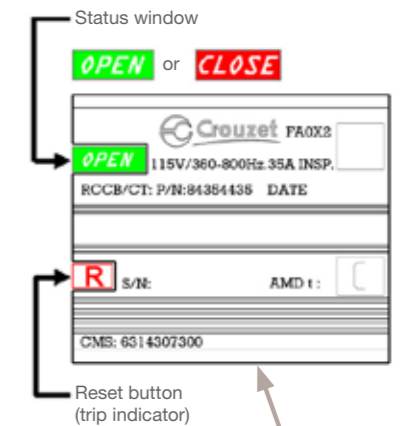
When the CB has tripped, the mechanical «TRIP indicator» is «popped out» and must be pushed back in manually to RESET the circuit breaker.

Our real MTBF figure of 300,000 Flight Hours (field value) during 20 years of service have convinced our customers to mount the RCCB successively on:

- › Galleys feeders
- › Cargo doors actuation motors
- › Flight control power packs (EHA and EBHA) of primary flight control actuators(spoilers; ailerons; rudder)

Hereafter is an illustration of the main aircraft locations of the RCCB:

FIN	Design	Bus bar	P/N
12C	GALLEY	A	84 354 335
1X	BULK FAN HEATER	A	84 354 33 5
3	RECIRC FAN	B	84 354 350
3JV1	HYD PUMP	B	84 354 350
6XN1	L INDB ELEVATOR POWER SPLY	C	84 354 350
1XX	R INDB ELEVATOR POWER SPLY	C	84 354 350
3XX	GND SUPPLY	A	84 354 350
3XX1HG1	RECIRC FAN	A	84 354 350
51N	107XP (IFE)	A	84 354 360
1MC	L-MID AILERON POWER SPLY	A	84 354 350
3J2	L-MID AILERON POWER SPLY	A	84 354 350
3J1	HYD PUMP GND SUPPLY	A	84 354 360
3C2	HYD PUMP	B	84 354 350
1HG	Y UPPER RUDDER POWER SUPPLY	A	84 354 350
5X	G UPPER RUDDER POWER SUPPLY	B	84 354 350
23MC	L SPOILERS POWER SUPPLY	A	84 354 350
3MC	R SPOILERS POWER SUPPLY	B	84 354 350
24M	SLAT E-MOT POWER 1	A	84 354 350
6N2	SLAT E-MOT POWER 2	B	84 354 350
2X	212XP GND SUPPLY	C	84 354 350



SMALL MODEL CIRCUIT BREAKER SINGLE POLE

DPMU



REFERENCES

Rating	No signal contact						Non polarised / polarised signal contact					
1 A	84 400 001	84 400 048/148	84 402 001	84 400 248	84 401 001	84 401 050	84 440 001	84 400 801/601	84 401 801/601	84 402 801/601		
2 A	84 400 002	84 400 049/149	84 402 002	84 400 249	84 401 002	84 401 051	84 440 002	84 400 802/602	84 401 802/602	84 402 802/602		
2.5 A	84 400 012	84 400 050/150	84 402 012	84 400 250	84 401 012	84 401 052	84 440 012	84 400 812/612	84 401 812/612	84 402 812/612		
3 A	84 400 003	84 400 051/151	84 402 003	84 400 251	84 401 003	84 401 053	84 440 003	84 400 803/603	84 401 803/603	84 402 803/603		
4 A		84 400 061/161		84 400 261								
5 A	84 400 005	84 400 052/152	84 402 005	84 400 252	84 401 005	84 401 054	84 440 005	84 400 805/605	84 401 805/605	84 402 805/605		
6 A			84 402 006							84 402 806/606		
7.5 A	84 400 007	84 400 053/153	84 402 007	84 400 253	84 401 007	84 401 055	84 440 007	84 400 807/607	84 401 807/607	84 402 807/607		
10 A	84 400 010	84 400 054/154	84 402 010	84 400 254	84 401 010	84 401 056	84 440 010	84 400 810/610	84 401 810/610	84 402 810/610		
15 A	84 400 015	84 400 055/155	84 402 015	84 400 255	84 401 015	84 401 057	84 440 015	84 400 815/615	84 401 815/615	84 402 815/615		
20 A	84 400 020	84 400 056/156	84 402 020	84 400 256	84 401 020	84 401 058	84 440 020	84 400 820/620	84 401 820/620	84 402 820/620		
25 A	84 400 025	84 400 057	84 402 025	84 400 225	84 401 025	84 401 059	84 440 025	84 400 825/625	84 401 825/625	84 402 825/625		
30 A	84 400 060	84 400 058	84 402 030	84 400 230			84 440 030	84 400 860/660	84 401 830/630	84 402 830/630		

Ratings 0.5; 0.75; 1.5 A are available.

Mounting hardware		HV																				
Threaded barrel	M12-0.75																					
	M12-100																					
	7/16																					
Terminal Screw	8-32 UNC																					
	M4																					
Terminal		Offset	Offset	Offset	Offset	Aligned	Aligned	Aligned	Offset	Aligned	Offset											

Button		HV																				
Green color																						
Black color																						
Long neck option																						

Conformity standard		HV																				
EN 2495					M																	
EN 2995																						004/005
EN 3773																						004
AS33201 - MS3320																						
VG 95345 TEIL 6																						
BACC 18Z&18AD like																						

Mass / MTBF / Vibration / Technical file		HV																				
Mass without mounting hardware (g)	< 18	< 18	< 18	< 18	< 18	< 18	< 18	< 20														< 20
Mass with mounting hardware (g)	< 21	< 20	< 20	< 20	< 20	< 20	< 20	< 22														< 22
MTBF FH (Typical)	> 7.2 M	> 7.2 M	> 7.2 M	> 7.2 M	> 7.2 M	> 7.2 M	> 7.2 M	> 7.2 M														> 3.6 M
Vibrations, for detail see below	MIL	MIL	VG	HV	EN	EN	EN															EN EN VG
Technical File																						SP4374/9944 SP9930 SP4356

GENERAL CHARACTERISTICS

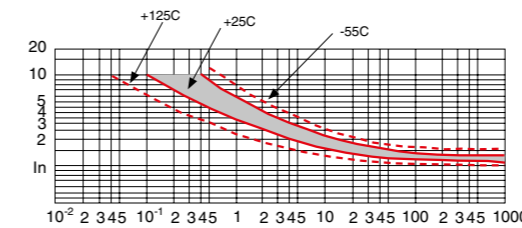
Electrical		115 VAC (400 Hz)		115 VAC 60 Hz-230 VAC 50 Hz	
Breaking current I _{co} + 2OCO	28 VDC	6000 A	2500 A		
Dielectric	1500 V	1500 V			
Endurance cycles	5000 (with L/R: 5 ms)	5000 (with cos φ: 0.7)			
Insulation resistance	above 100 MΩ	above 100 MΩ			
Working life (endurance) at 5x RC	50 cycles	50 cycles			
Auxiliary contact current	0.1..0.2 A	0.1..0.2 A			
Voltage drop compliance	EN2495/2995/MS3320/AS33201	EN2495/2995/MS3320/AS33201			

Mechanical	
Operating force	3,5N< push<45N / 5N<pull<30N
Endurance	without load: 5000 cycles resistive load: 2500 cycles
Tightening torque	barrel nut: recommended: 4 ± 0.25 N.m maximum : 5.0 N.m terminal screw: recommended: 1.6 ± 0.1 N.m maximum : 2.0 N.m

Environmental	
Salt spray	48h 5% NaCl
Humidity: Test b	RTCA DO160 10 cycles
Operating temperature	-60°C +125°C for all ratings except 30 A: - 60°C + 90°C
Acceleration (centrifugal)	17 g
Vibrations	EN (at 70°C)
Sinusoidal (80..2000 Hz)	10 g-PK and 5g-PK after 500Hz at 90% of RC
Random (10.. 2000 Hz)	5.82 Grms at 90% of RC
Shock	50 g halfsine 11 msec 6 directions

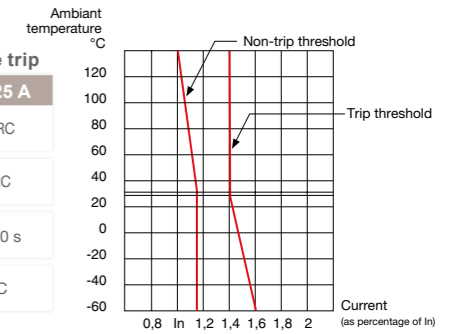
CURVES

Trip times envelope for temperature from -55°C to 125°C (direct overload)

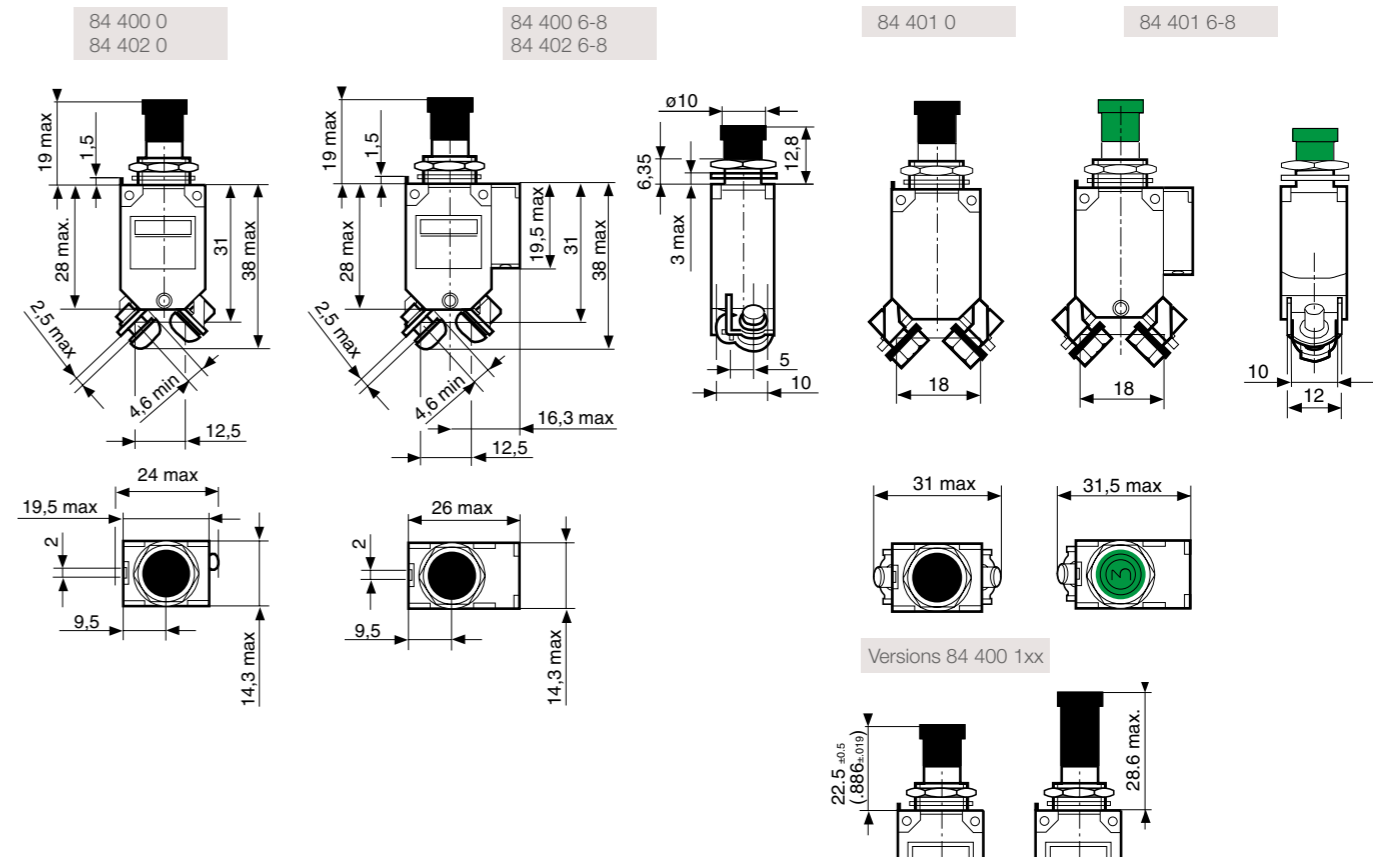


Maximum and minimum limit of ultimate trip

Rating	1.5 → 5 A	7.5 → 25 A
Non tripping point at 25°C	1.15 * RC	1.15 * RC
Tripping point at 25°C	1.4 * RC	1.4 * RC
Tripping time at 2 * RC	2 s → 15 s	4 s → 20 s
Non tripping point at 125°C	1 * RC	1 * RC



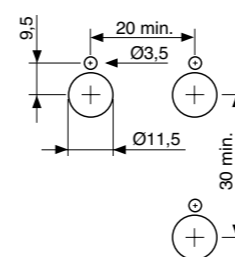
DIMENSIONS



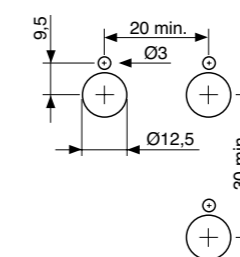
PANEL CUTOUT RECOMMENDATION

Thickness: 1.6 mm → 3 mm

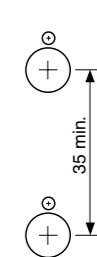
Versions 84 400 0



Versions 84 402 0

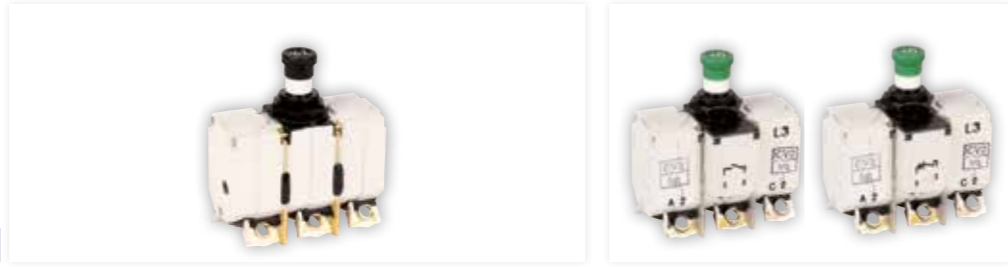


Versions 84 401 0 - 6 - 8



SMALL MODEL CIRCUIT BREAKER THREE POLE

DPMT



REFERENCES

Rating	No signal contact						Non polarised/polarised signal contact					
1 A	84 410 001	84 411 001	84 412 001	84 413 001	84 414 001	84 450 001	84 410 801/601	84 411 801/601	84 412 801/601			
2 A	84 410 002	84 411 002	84 412 002	84 413 002	84 414 002	84 450 002	84 410 802/602	84 411 802/602	84 412 802/602			
2.5 A	84 410 012	84 411 012	84 412 012	84 413 012	84 414 012	84 450 012	84 410 812/612	84 411 812/612	84 412 812/612			
3 A	84 410 003	84 411 003	84 412 003	84 413 003	84 414 003	84 450 003	84 410 803/603	84 411 803/603	84 412 803/603			
4 A			84 412 004						84 412 804/604			
5 A	84 410 005	84 411 005	84 412 005	84 413 005	84 414 005	84 450 005	84 410 805/605	84 411 805/605	84 412 805/605			
6 A			84 412 006						84 412 806/606			
7.5 A	84 410 007	84 411 007	84 412 007	84 413 007	84 414 007	84 450 007	84 410 807/607	84 411 807/607	84 412 807/607			
10 A	84 410 010	84 411 010	84 412 010	84 413 010	84 414 010	84 450 010	84 410 810/610	84 411 810/610	84 412 810/610			
15 A	84 410 015	84 411 015	84 412 015	84 413 015	84 414 015	84 450 015	84 410 815/615	84 411 815/615	84 412 815/615			
20 A	84 410 020	84 411 020	84 412 020	84 413 020	84 414 020	84 450 020	84 410 820/620	84 411 820/620	84 412 820/620			
25 A	84 410 025	84 411 025	84 412 025	84 413 025	84 414 025	84 450 025	84 410 825/625	84 411 825/625	84 412 825/625			
30 A			84 412 030	84 413 030		84 450 030						

Mounting hardware

	M12-0.75									
Threaded barrel	M12-100									
Terminal Screw	8-32 UNC									
Terminal	M4									
		Offset	Offset	Offset	Offset	Offset	Aligned	Offset	Offset	Offset

Button

Green color										
Black color										
Long neck										

Conformity standard

EN 2592		U	M							
EN 3774		004		003						
EN 2996								004/005		
VG 95345 TEIL 11										
AS 14154B/MS14154						QPL				
BACC 18AC&18AE like										

Mass / MTBF / Vibration / Technical file

Mass without mounting hardware (g)										< 51
Mass with mounting hardware (g)										< 60
MTBF FH (Typical)										> 700 000
Vibration, for detail see below	MIL	EN	VG	EN	MIL	EN	EN	EN	EN	EN
Technical File										

GENERAL CHARACTERISTICS

Electrical	115/200 VAC (400 Hz)	115/200 VAC 60 Hz-230/400 VAC 50 Hz
Breaking current 1CO + 2OCO	2000 A	
Dielectric	1500 V	
Endurance (electrical overloads)	5000 (with cos fi: 0.7)	
Insulation resistance	above 100 MΩ	
Working life (endurance) at 5xRC	50 cycles	
Auxiliary contact current	0.1..0.2 A	
Voltage drop compliance	MS14154/AS14154A/EN2592/2996/3774	

CONTACT CROUZET

Mechanical

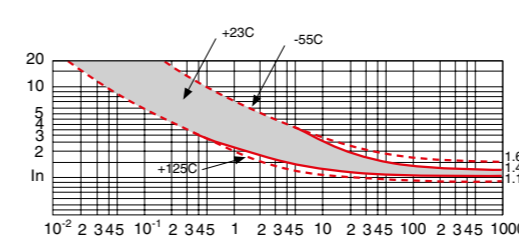
Operating force	8N<push<80N / 5N<pull<30N
Endurance (manual open/close)	no load / 5000 cycles on resistive load / 5000 cycles
Tightening torque	barrel nut: recommended: 4 ± 0.25 N.m maximum : 5.0 N.m terminal screw: recommended: 1.6 ± 0.1 N.m maximum : 2.0 N.m

Environmental

Salt spray	48h 5% NaCl
Humidity: Test b	RTCA DO160 10 cycles
Operating temperature	-60°C +125°C for all ratings except 30 A: - 60°C + 90°C
Acceleration (centrifugal)	17 g
Vibrations	EN (at 70°C)
Sinusoidal (80..2000 Hz)	10 g-PK and 5g-PK after 500Hz at 90 % of RC
Random (10.. 2000 Hz)	5.82 Grms at 90 % of RC
Shock	50 g halfsine 11 msec 6 directions

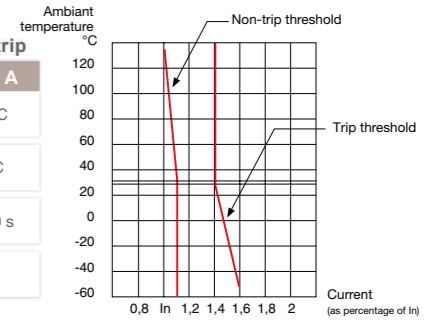
CURVES

Trip times envelope for temperature from -55°C to 125°C (direct overload)

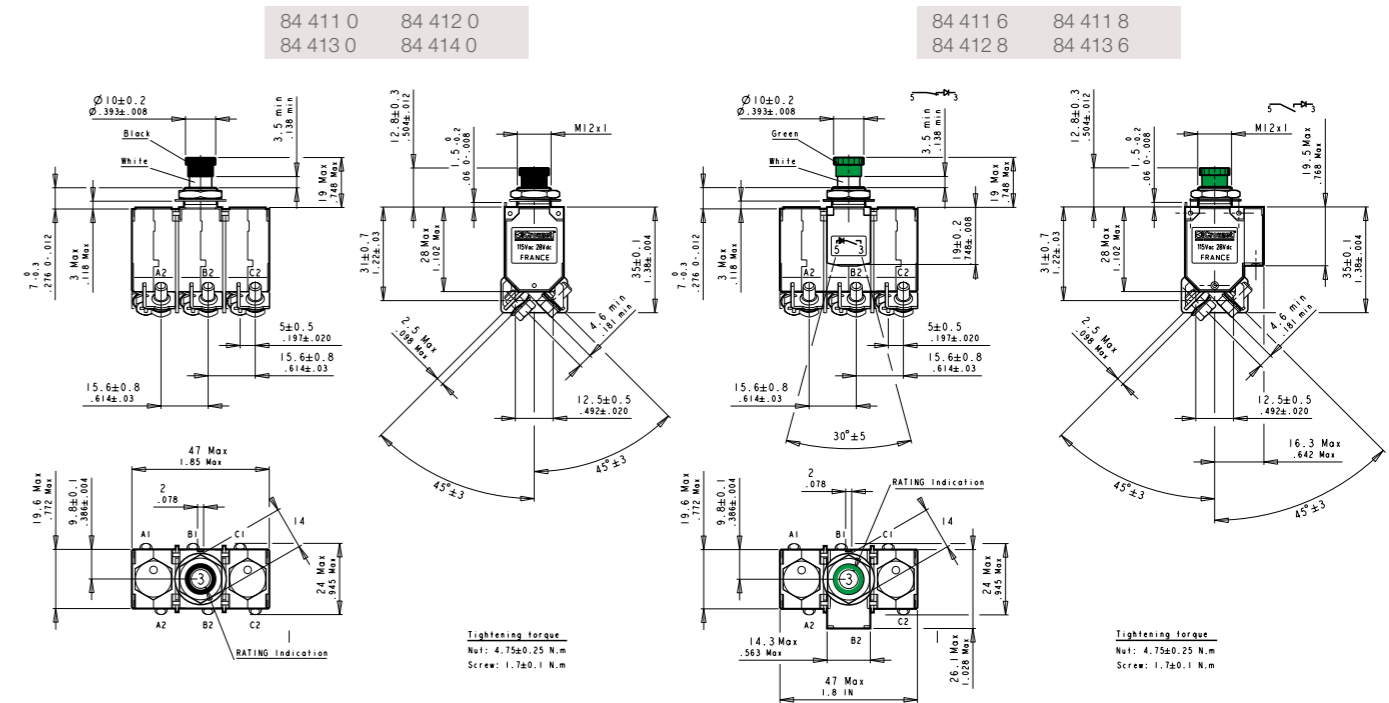


Maximum and minimum limit of ultimate trip

Rating	1.5 → 5 A	7.5 → 25 A
Non tripping point at 25°C	1.15 * RC	1.15 * RC
Tripping point at 25°C	1.4 * RC	1.4 * RC
Tripping time at 2 * RC	2 s → 15 s	4 s → 20 s
Non tripping point at 125°C	1 * RC	1 * RC



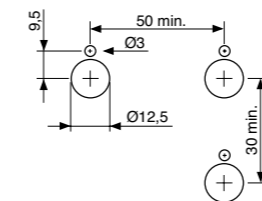
DIMENSIONS



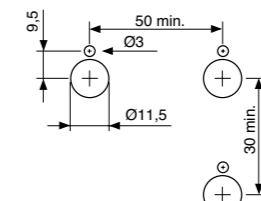
PANEL CUTOUT RECOMMENDATION

Thickness: 1.6 mm → 3 mm

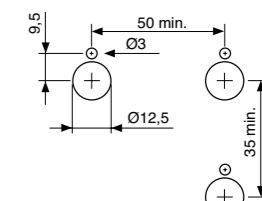
84 411 0 84 412 0
84 413 0



84 414 0



84 411 6 84 411 8
84 412 8 84 413 6



BIG MODEL CIRCUIT BREAKER SINGLE POLE

DGMU



REFERENCES

Rating	No signal contact	No signal contact long trip time	Non polarised/polarised signal contact	Polarised signal contact
15 A	84 306 015			
20 A	84 306 020	84 306 016		
25 A	84 306 025	84 306 017	84 306 825	84 306 320/620
30 A	84 306 030		84 306 830	84 306 316/616
35 A	84 306 035	84 306 018	84 306 835	84 306 325/625
40 A	84 306 040		84 306 840	84 306 317/617
50 A	84 306 050	84 306 019	84 306 850	84 306 330/630
60 A		84 306 860	84 306 860	84 306 335/635
				84 306 318/618
				84 306 340/640
				84 306 319/619
				84 306 321/621

Mounting hardware					
Threaded barrel	M12-0.75				
	M12-100				
Terminal Screw	8-32 UNC				
	M4				
Hole ø5.5 for Bus-Bar & 40° angle					

Button					
Green color					
Black color					

Conformity standard					
EN 2794		003	004		
EN 3661				004/005	004/005
BACC 18R&18X like					006

Mass / MTBF / Vibration / Technical file					
Mass without mounting hardware (g)		61		61	66
Mass with mounting hardware (g)		65		65	70
MTBF FH (Typical)		> 10 M		> 10 M	> 6 M
MIL vibration condition Sinus/Random		A & C		A & C	A & C
Technical File		-	SP4393	-	SP4339

GENERAL CHARACTERISTICS

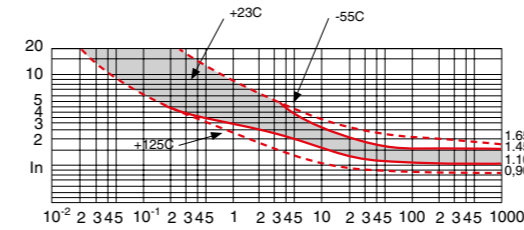
Electrical				
Breaking current I _{co} + 2OCO	28 VDC	115 VAC (400 Hz)		115 VAC 60 Hz-230 VAC 50Hz
Dielectric	4000 A ; 2000 A long trip	2000 A ; 1500 A long trip		
Endurance (electric overloads)	1500 V	1500 V		
Insulation resistance	5000 (with L/R: 5 ms)	5000 (with cos fi: 0.7)		
Working life (endurance) at 5xRC	above 100 MΩ	above 100 MΩ		
Voltage drop compliance	50 cycles	50 cycles		
	EN2794/3661	EN2794/3661		

Mechanical				
Operating force	3,5N<push<55N / 5N<pull<40N			
Endurance (manual open/close)	no load : 5 000 cycles			
	on resistive load : 2 500 cycles			
Tightening torque	barrel nut: recommended: 4 ± 0.25 N.m maximum : 5.5 N.m	terminal screw: recommended: 2.35 ± 0.15 N.m maximum : 2.5 N.m		

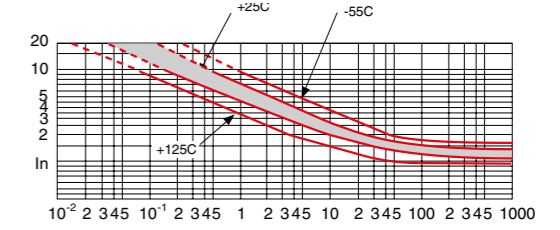
Environmental				
Salt spray	48h / 5% NaCl			
Humidity: Test b	RTCA DO160 / 10 cycles			
Operating temperature	-60°C +125°C			
Acceleration (centrifugal)	up to 17g			
Shock	50 g 3 halfsine 11 msec 6 directions			
Vibration (sinusoidal)	10 g-PK from 70 to 20000 Hz (MIL STD202 method 204 D condition A with 90 % of RC)			
Vibration (random at RC)	9.26 Grms (MIL STD202 method 214 A condition C with 90 % of RC)			

CURVES

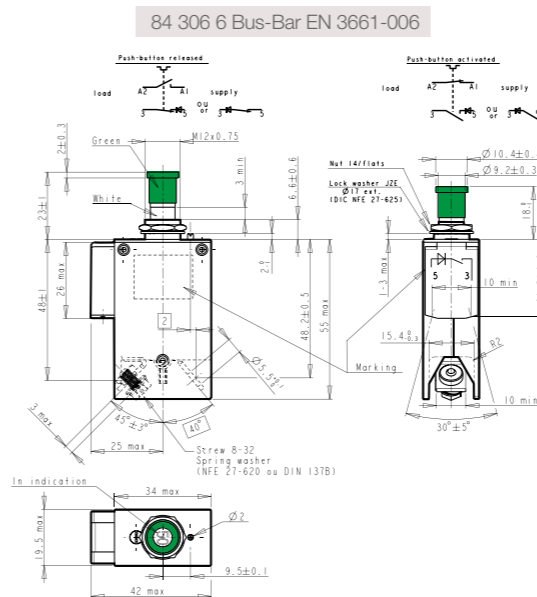
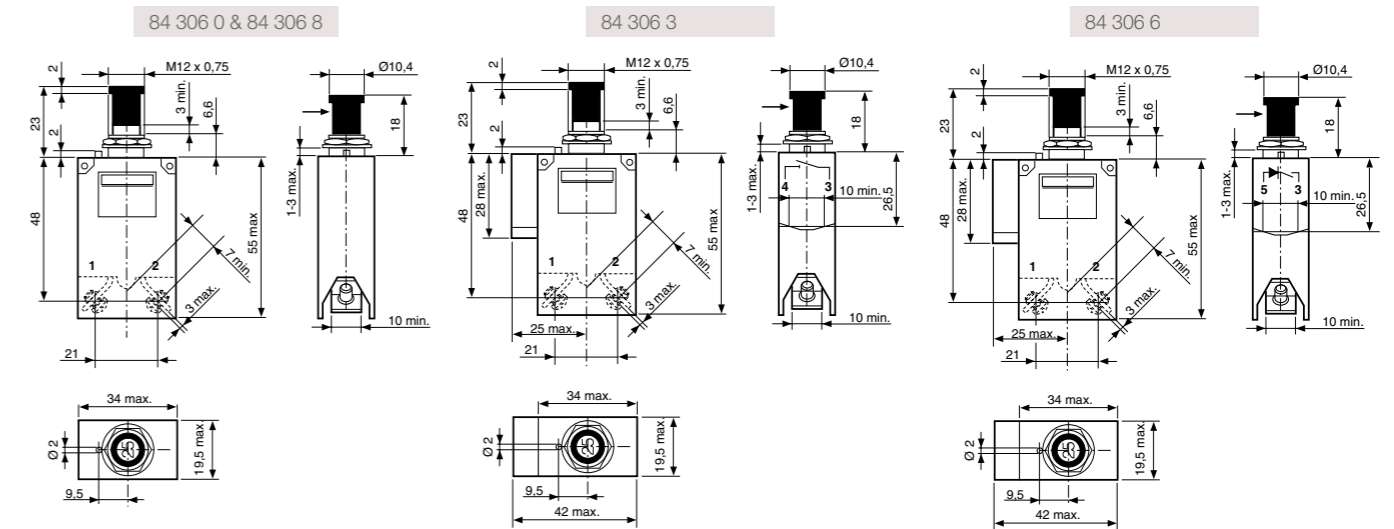
Standard trip time (EN compliant)



Long trip time

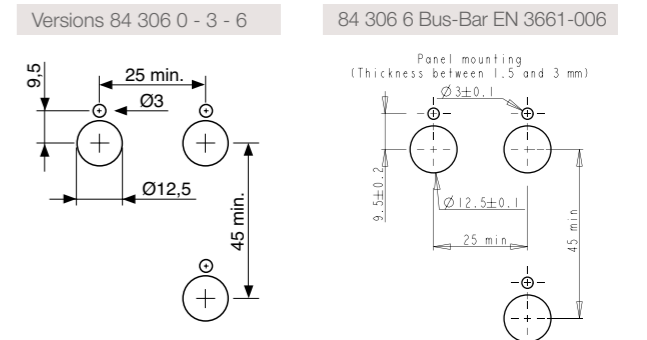


DIMENSIONS



PANEL CUTOUT RECOMMENDATION

Thickness 1.6 mm → 3 mm



BIG MODEL CIRCUIT BREAKER THREE POLE

DGMT



REFERENCES

Rating	No signal contact			No signal contact long trip time	Non polarised/polarised signal contact		Polarised signal contact
15 A	84 313 015						
20 A	84 313 020	84 313 036	84 313 061	84 313 820	84 313 320/620	84 313 316/613	84 313 621/631
25 A	84 313 025	84 313 037	84 313 062	84 313 825	84 313 325/625	84 313 317/617	84 313 622/632
30 A				84 313 830	84 313 330/630		
35 A	84 313 035	84 313 038	84 313 063	84 313 835	84 313 335/635	84 313 318/618	84 313 623/633
41 A	84 313 041			84 313 840			
50 A	84 313 050	84 313 058	84 313 066	84 313 850	84 313 350/650	84 313 319/619	84 313 624/634
60 A				84 313 860			

Mounting hardware

Threaded barrel	M12-0.75						
M12-100							
Terminal Screw	8-32 UNC						
M4							
Hole ø5.5 for Bus-Bar & 40° angle							

Button

Green color							
Black color							

Conformity standard

EN 2665	003	004					
EN 3662					004/005	004/005	006
10-60806 like							

Mass / MTBF / Vibration / Technical file

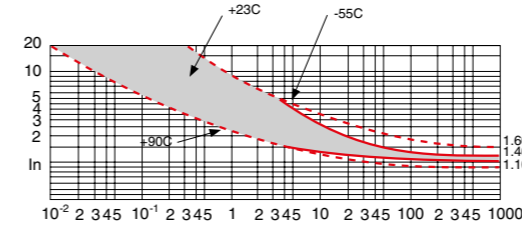
Mass without mounting hardware (g)		156		156		161	
Mass with mounting hardware (g)		165		165		170	
MTBF FH (Typical)		> 5 M		> 5 M		> 26 M	
MIL vibration condition Sinus/Random		A & C		A & C		A & C	
Technical File		SP4679	ASNE459			SP4340	SP4346

GENERAL CHARACTERISTICS

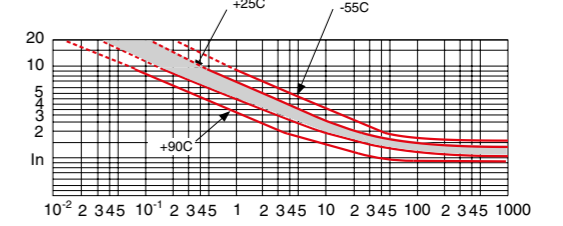
Electrical		CONTACT CROUZET	
Breaking current 1CO + 2OCO	115/200 VAC (400 Hz) 2000 A ; 1500 A long trip	115/200 VAC 60 Hz-230/400 VAC 50 Hz	
Dielectric	1500 V		
Endurance (electric overloads)	5000 (with cos fi: 0.7)		
Insulation resistance	above 100 MΩ		
Working life (endurance) at 5xRC	50 cycles		
Auxiliary contact current	0.1...0.2 A		
Voltage drop compliance	EN2665/3662		
Mechanical			
Operating force	20N<push<80N / 5N<pull<45N		
Endurance (manual open/close)	no load : 5000 cycles on resistive load : 2500 cycles		
Tightening torque	barrel nut: recommended: 4 ± 0.25 N.m maximum: 5.5 N.m terminal screw: recommended: 2.35 ± 0.15 N.m maximum : 2.5 N.m		
Environmental			
Salt spray	48h / 5% NaCl		
Humidity: Test b	RTCA DO160 / 10 cycles		
Operating temperature	-55°C +90°C		
Acceleration	up to 40 g		
Shock	50 g 3 halfsine 11 msec 6 directions		
Vibration (sinusoidal)	10 g-PK from 70 to 20000 Hz (MIL STD202 method 204 D condition A with 90 % of RC)		
Vibration (random at RC)	9.26 Grms (MIL STD202 method 214 A condition C with 90 % of RC)		

CURVES

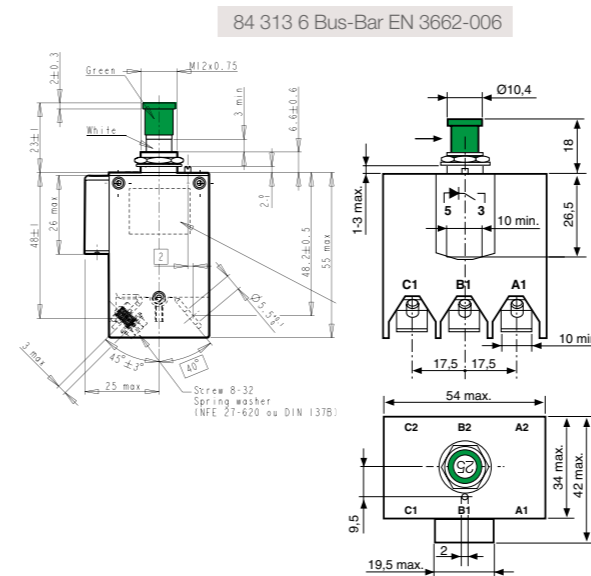
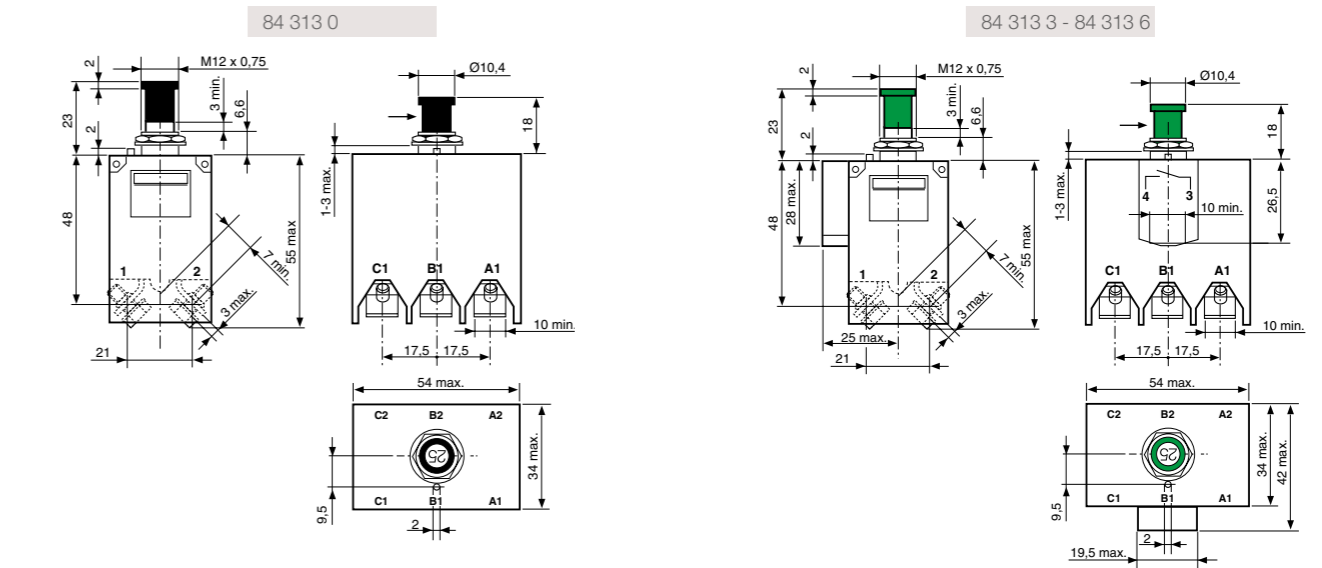
Standard trip time (EN compliant)



Long trip time

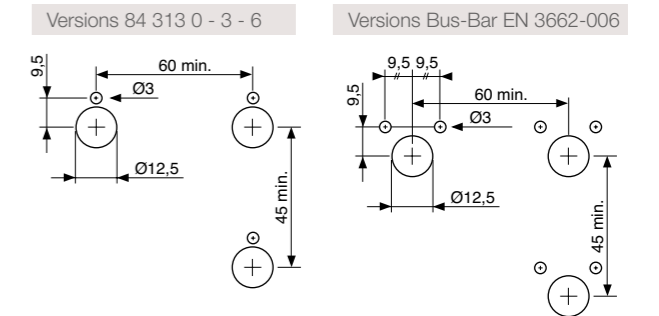


DIMENSIONS



PANEL CUTOUT RECOMMENDATION

▷ Thickness 1.6 mm → 3 mm



FROG LEGS TERMINALS

SMALL MODEL CIRCUIT BREAKER



REFERENCES

Rating	1 pole 45°	1 pole 60°	3 pole 45°	3 pole 60°
0.5 A	84 406 011			
1 A	84 406 001	84 437 001	84 417 001	84 417 201
2 A	84 406 002	84 437 002	84 417 002	84 417 202
2.5 A	84 406 012	84 437 012	84 417 012	84 417 212
3 A	84 406 003	84 437 003	84 417 003	84 417 203
4 A*				
5 A	84 406 005	84 437 005	84 417 005	84 417 205
6 A*				
7.5 A	84 406 007	84 437 007	84 417 007	84 417 207
10 A	84 406 010	84 437 010	84 417 010	84 417 210
15 A	84 406 015	84 437 015	84 417 015	84 417 215
20 A	84 406 020	84 437 020	84 417 020	84 417 220
25 A	84 406 025	84 437 025	84 417 025	84 417 225
30 A		84 437 030	84 417 030	84 417 230

* contact Crouzet for this rating

Mounting hardware

Threaded barrel	M12-0.75	M12-100	7/16	6-32 UNC	M4
Terminal Screw					

Button color

Green					
Black					

Conformity standard

EN 2495*					
EN 2995*					
EN 2592*					
EN 2996*					
EN 3774*					
MS26574 **	QPL				

* for performance ** for terminal configuration

Mass/MTBF/technical file

	1 pole 45°	1 pole 60°	3 pole 45°	3 pole 60°
Mass without mounting hardware (g)	< 18	< 18	< 54	< 56
Mass with mounting hardware (g)	< 20	< 20	< 21	< 65
MTBF FH (Typical)	> 7.2 M	> 7.2 M	> 1.7 M	> 1.7 M
Technical file	SP 990100	SP 991700	SP 992000	SP 991900

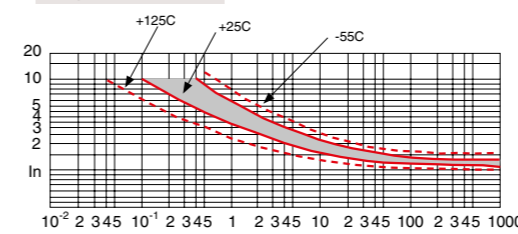
GENERAL CHARACTERISTICS

Electrical	Single Pole	Three pole
Breaking current 1CO + 2OCO	28 VDC 6000 A	115 VAC (400 Hz) 2500 A
Dielectric	1500 V	1500 V
Endurance cycles	5000 (with L/R: 5 ms)	5000 (with cos fi: 0.7)
Insulation resistance	above 100 MΩ	above 100 MΩ
Working life (endurance) at 5xRC	50 cycles	50 cycles
Auxiliary contact current (if present)	0.1..0.2 A	0.1..0.2 A
Voltage drop compliance	EN2495/2995/MS3320/AS33201	EN2495/2995/MS3320/AS33201
MS14154/AS14154A/EN2592/2996/3774		
Mechanical		
Operating force	3,5N< push<45N / 5N<pull<30N mechanical (no load) 5 000 cycles on resistive load 2 500 cycles	8N<push<80N / 5N<pull<80N mechanical (no load) 5000 cycles on resistive load 2500 cycles
Endurance		
Tightening torque (barrel nut)	recommended: 4 ± 0.25 N.m maximum : 5.0 N.m	recommended: 4±0.25 N.m maximum: 5.0 N.m
Tightening torque (terminal screw)	recommended: 1.6 ± 0.1 N.m maximum : 2.0 N.m	recommended: 1.6±0.1 N.m maximum: 2.0 N.m
Environmental		
Salt spray	48h 5% NaCl	
Humidity: Test b	RTCA DO160 10 cycles	
Operating temperature	-60°C +125°C for all ratings except 30 A: - 60°C + 90°C	
Acceleration (centrifugal)	up to 40 g	
Shock	50 g alfsine 11 msec	

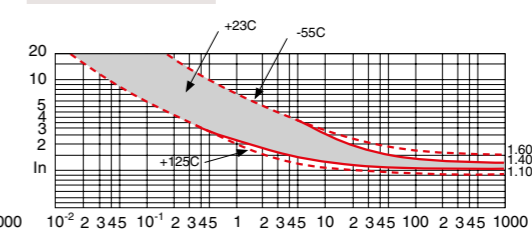
CURVES

Trip times envelope for temperature from -55°C to 125°C (direct overload)

single pole



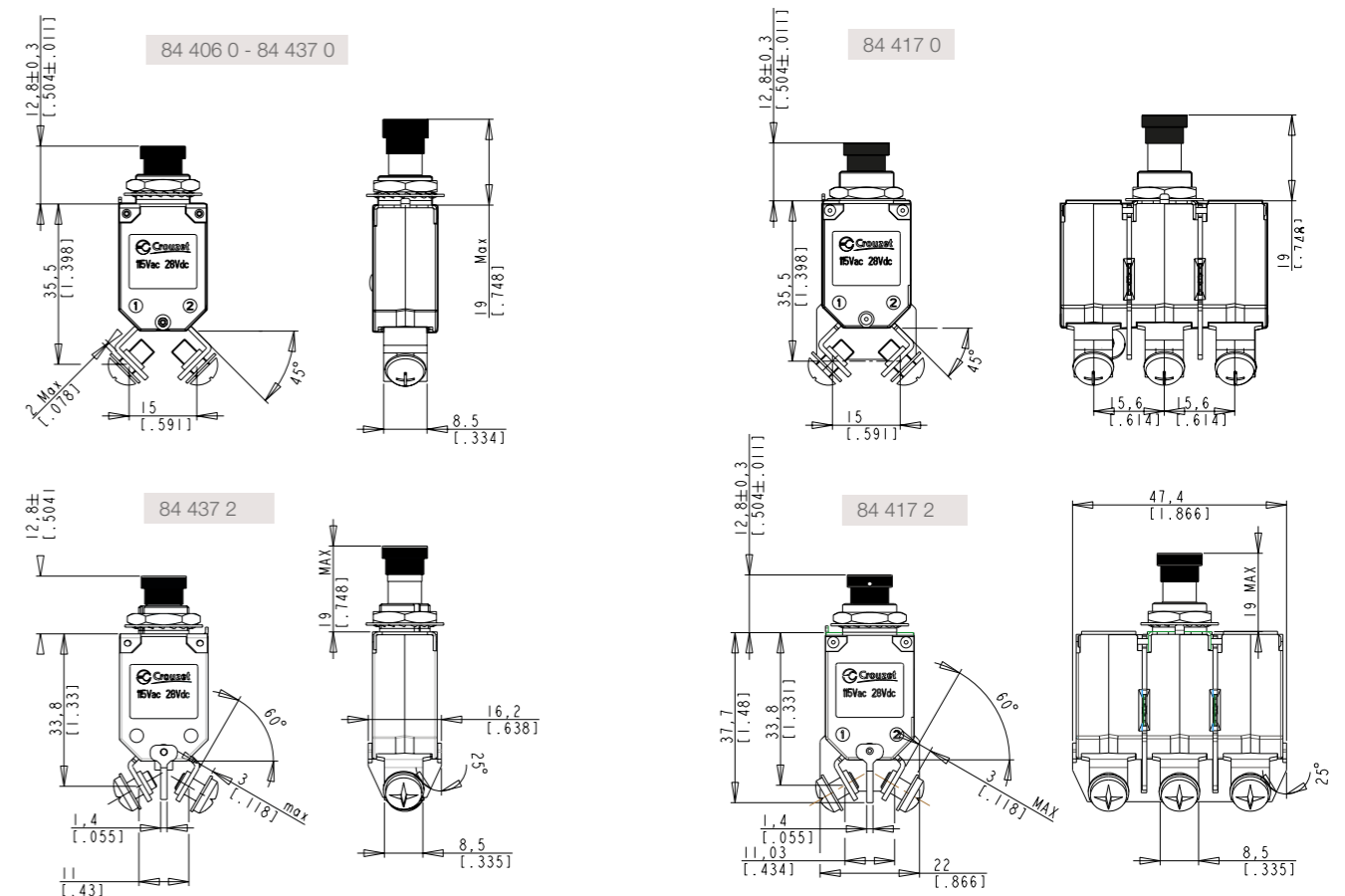
three pole



Maximum and minimum limit of ultimate trip

Rating	1.5 → 5 A	7.5 → 25 A
Non tripping point at 25°C	1.15 * RC	1.15 * RC
Tripping point at 25°C	1.4 * RC	1.4 * RC
Tripping time at 2 * RC	2 s → 15 s	4 s → 20 s
Non tripping point at 125°C	1 * RC	1 * RC

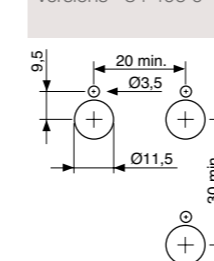
DIMENSIONS



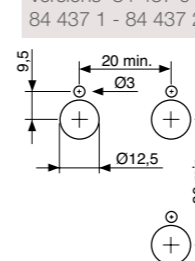
PANEL CUTOUT RECOMMENDATION

Thickness 1.6 mm → 3 mm

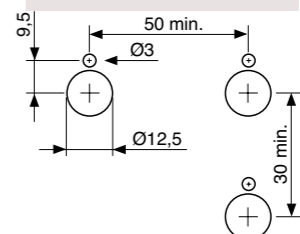
Versions 84 406 0



Versions 84 437 0
84 437 1 - 84 437 2



Versions 84 417 0 - 84 417 1
84 417 20



PUSH-PULL PUSH-FIT 6.3 MM BLADE

SMALL MODEL CIRCUIT BREAKER



REFERENCES

Rating	no auxiliary contacts	no auxiliary contacts	no polarised/polarised	no auxiliary contacts
0.5 A		84 408 111		84 418 011
1 A	84 408 001	84 408 101	84 408 801/601	84 418 001
2 A	84 408 002	84 408 102	84 408 802/602	84 418 002
2.5 A	84 408 012	84 408 112	84 408 812/612	84 418 012
3 A	84 408 003	84 408 103	84 408 803/603	84 418 003
4 A	84 408 004	84 408 104	84 408 804/604	84 418 004
5 A	84 408 005	84 408 105	84 408 805/605	84 418 005
6 A	84 408 006	84 408 106	84 408 806/606	84 418 006
7.5 A	84 408 007	84 408 107	84 408 807/607	84 418 007
10 A	84 408 010	84 408 110	84 408 810/610	84 418 010
15 A	84 408 015	84 408 115	84 408 815/615	84 418 015
20 A	84 408 020	84 408 120	84 408 820/620	84 418 020
25 A	84 408 025	84 408 125	84 408 825/625	84 418 025

Mounting hardware				
Straight terminals without screws	•	•	•	•
Barrel threadings				
Conical barrel	•	•	•	•

Button				
Green color			•	
Black color	•	•		•
Long neck (long button)		•	•	

Conformity standard				
EN 2495*	•			•
EN 2995*		004	005	
EN3773-006	•	•		
EN3774-006				•
AS 33201	•	•	•	

* for thermal performance and auxiliary contact performance

Mass/MTBF / Technical file				
No mounting hardware	< 14,5	< 15,5	< 16,5	< 51
MTBF FH (Typical)	> 7.2 M	> 7.2 M	> 3.6 M	> 1.7 M
Technical file	SP 991600	SP 991800	SP 991800	SP 991500

GENERAL CHARACTERISTICS

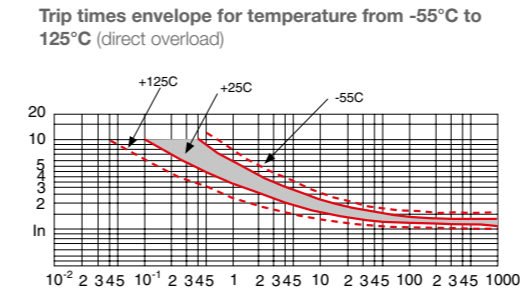
Electrical	Single pole		Three pole
		28 VDC	115 VAC (400 Hz)
Breaking current 1CO + 2OCO	6000 A	2500 A	2000 A
Dielectric	1500 V	1500 V	1500 V
Endurance cycles	5000 (with L/R: 5 ms)	5000 (with cos fi: 0.7)	5000 (with cos fi: 0.7)
Insulation resistance	above 100 MΩ	above 100 MΩ	above 100 MΩ
Working life (endurance) at 5xRC	50 cycles	50 cycles	50 cycles
Auxiliary contact current (if present)	0.1..0.2 A	0.1..0.2 A	0.1..0.2 A
Voltage drop compliance	EN2495/2995/MS3320/AS33201	EN2495/2995/MS3320/AS33201	MS14154/AS14154A/EN2592/2996/3774

Mechanical	
Operating force	3,5N<push<45N / 5N<pull<30N
Endurance	mechanical (no load) 5 000 cycles on resistive load 2 500 cycles
Tightening torque (barrel nut)	recommended: 4 ± 0.25 N.m maximum : 5.0 N.m
Tightening torque (terminal screw)	recommended: 1.6 ± 0.1 N.m maximum : 2.0 N.m

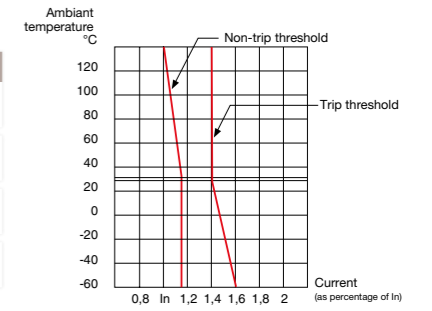
Environmental	
Salt spray	48h 5% NaCl
Humidity: Test b	RTCA D0160 10 cycles
Operating temperature	-60°C +125°C for all ratings except 30 A: - 60°C + 90°C
Acceleration (centrifugal)	up to 40 g
Shock	50 g 3 halvesine 11 msec
Vibration (sinusoidal) single pole	10 g-PK from 70 to 2000 Hz (MIL STD 202 method 204 D condition B with 90% of RC)
Vibration (random) single pole	9.26 Grms (MIL STD 202 method 214 A condition E with 90% of RC)

PUSH-FIT 0.25 INCH TAB

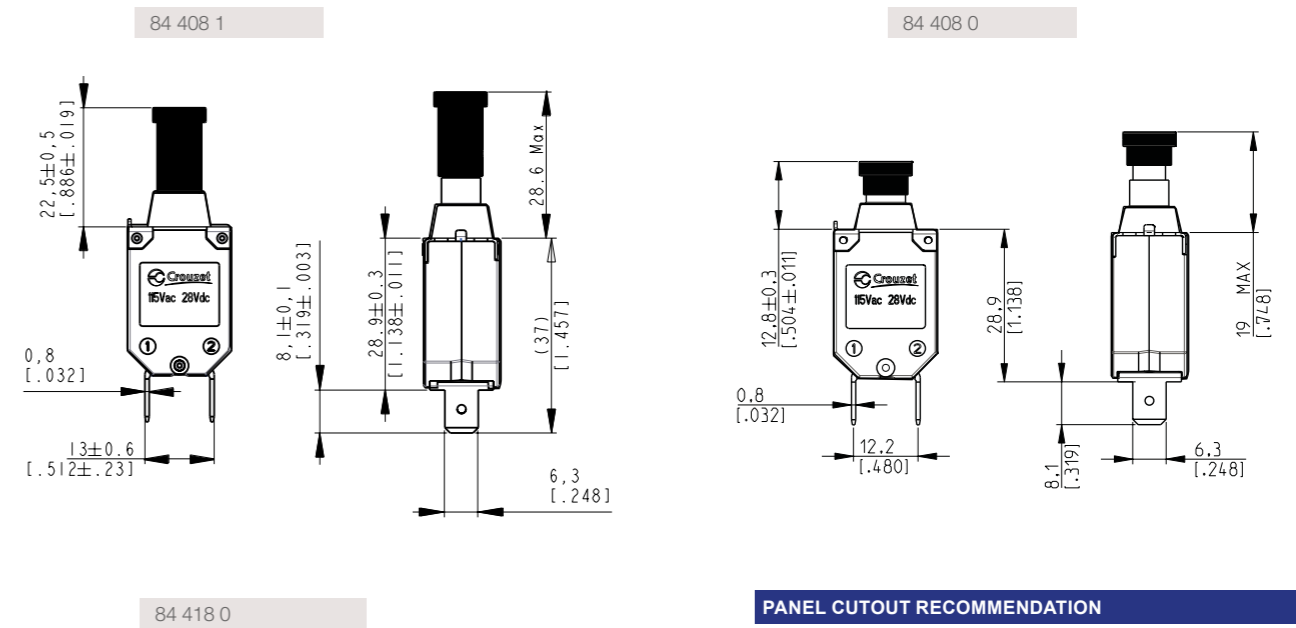
CURVES



Rating	1.5 → 5 A	7.5 → 25 A
Non tripping point at 25°C	1.15 * RC	1.15 * RC
Tripping point at 25°C	1.4 * RC	1.4 * RC
Tripping time at 2 * RC	2 s → 15 s	4 s → 20 s
Non tripping point at 125°C	1 * RC	1 * RC

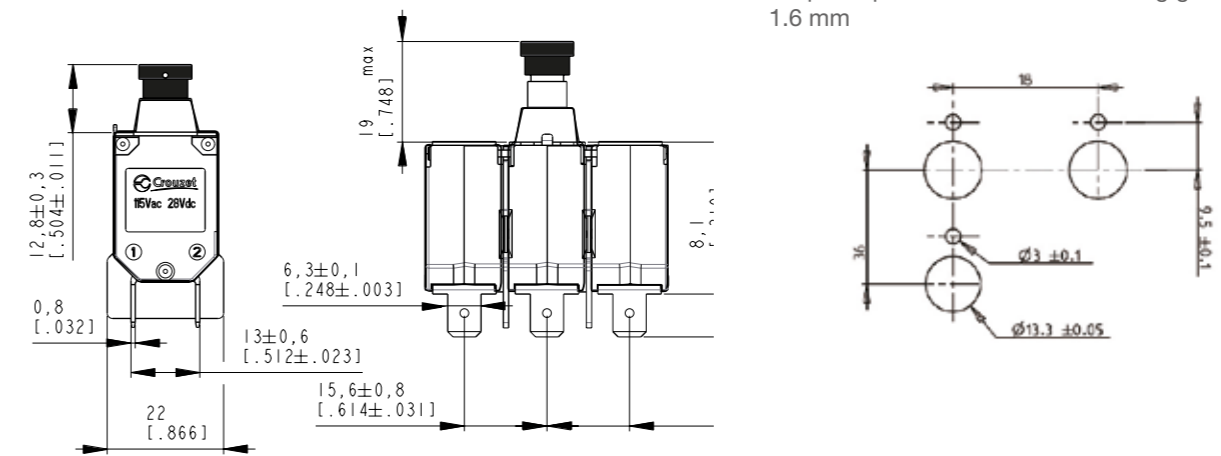


DIMENSIONS



PANEL CUTOUT RECOMMENDATION

› Required panel thickness for centring grommet 79219333: 1.6 mm



PUSH-PUSH & FLYING LEADS VERSION

SINGLE POLE SMALL MODEL CIRCUIT BREAKER

Read also p. 48



REFERENCES

Rating	Faston	Flying leads
1 A	84 405 001	
1.5 A		84 405 040
2 A	84 405 002	
2.5 A	84 405 012	
3 A	84 405 003	
5 A	84 405 005	84 405 045
7.5 A	84 405 007	
10 A	84 405 010	
15 A	84 405 015	
20 A	84 405 020	
25 A	84 405 025	

Mounting hardware

	Faston terminal	Barrel nut M12-100 + 500mm flying leads
Button color		
White	•	•

Conformity standard

Air 6 625-403	•	•
GAM TI-II-40	•	•
EN 3773-3774*	•	•
* our equipment complies with EN standards		

Mass / MTBF / Technical file

Weight	< 15	< 25
MTBF FH (Typical)	> 3.6 M	> 3.6 M
Technical file		SP 4397 & SP 9925

GENERAL CHARACTERISTICS

Electrical	28 VDC	115 VAC (400 Hz)	115 VAC 60 Hz-230 VAC 50 Hz
Breaking current 1CO + 2OCO	3000 A	1500 A	
Dielectric	1500 V	1500 V	
Endurance cycles	5000	5000	
Insulation resistance	above 100 MΩ	above 100 MΩ	CONTACT Crouzet
Working life (endurance) at 5° RC	1000 cycles	1000 cycles	
Auxiliary contact current	0.1..0.2 A	0.1..0.2 A	
Voltage drop compliance	EN2495/2995/MS3320/AS33201	EN2495/2995/MS3320/AS33201	

Mechanical

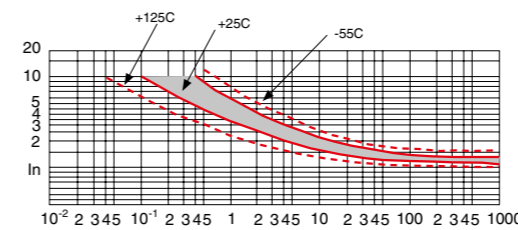
Operating force		
Endurance	no load	40 000 cycles
	on resistive load	40 000 cycles
Tightening torque (barrel nut)	recommended: 4 N.m ; Max.: 5 N.m	
Tightening torque (terminal screw)	1.7 N.m ±0.1	

Environmental

Salt spray	48h	5% NaCl
Humidity: Test b	RTCA DO160	10 cycles
Operating temperature	-60°C +125°C	
Acceleration	up to 20 g	
Shock	up to 50 g (11 ms)	
Vibration (sinusoidal)		10 g-PK from 10 to 2000 Hz
Vibration (random at RC)		up to 9.26 Grms from 10 to 2000 Hz

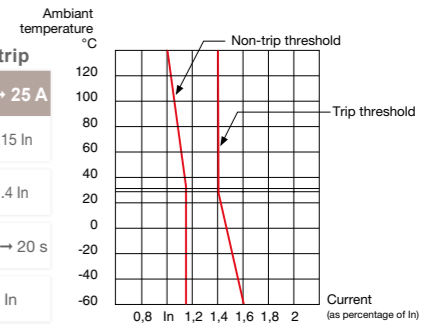
CURVES

Trip times envelope for temperature from -55°C to 125°C (direct overload)

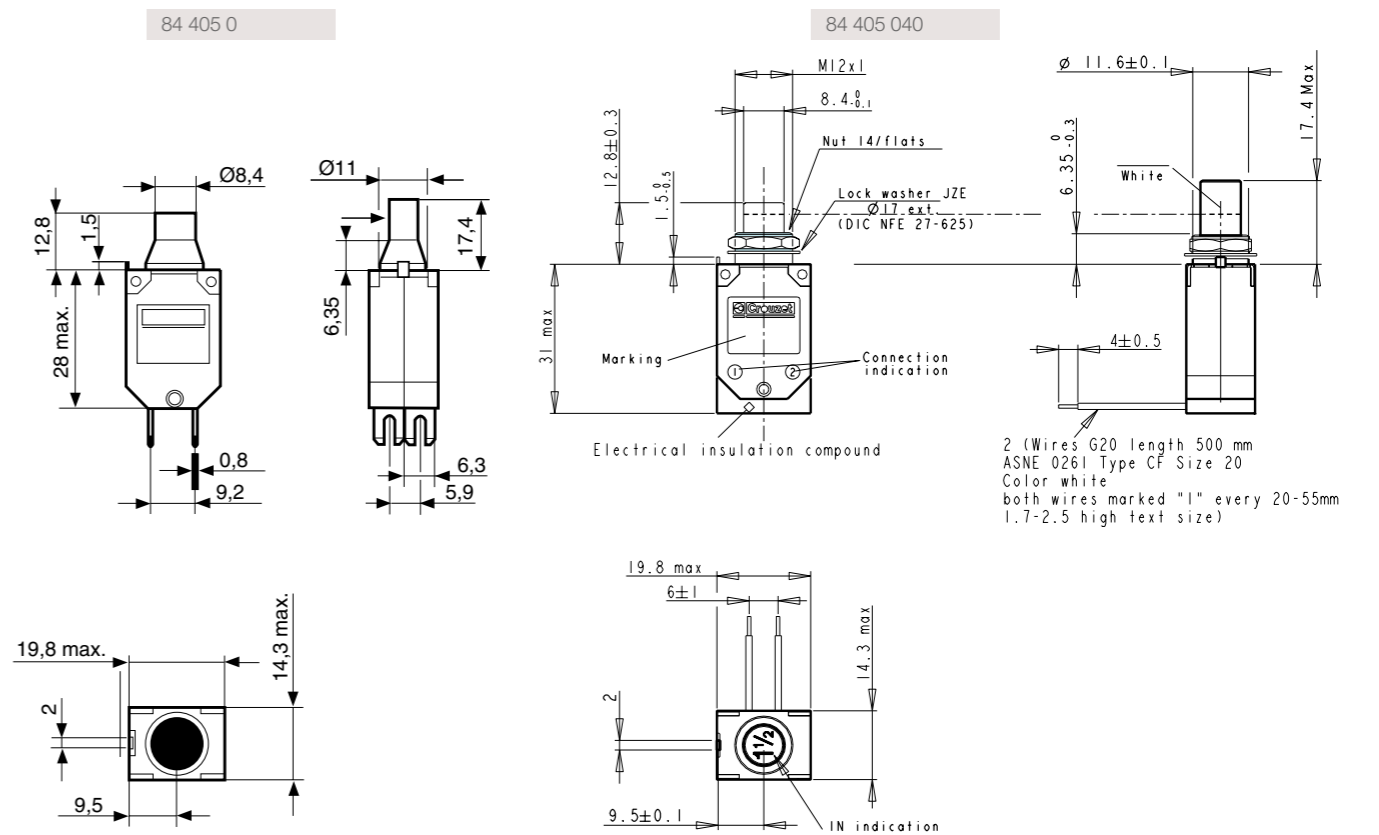


Maximum and minimum limit of ultimate trip

Rating	1 → 3 A	5 → 25 A	5 → 25 A
Non tripping point at 25°C	1.15 In	1.15 In	1.15 In
Tripping point at 25°C	1.4 In	1.4 In	1.4 In
Tripping time at 2° RC	2 s → 15 s	4 s → 16 s	6 s → 20 s
Non tripping point at 125°C	In	In	In

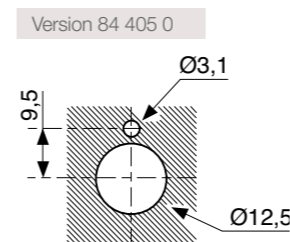


DIMENSIONS

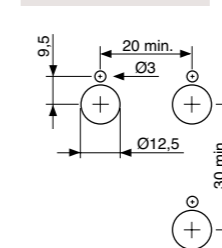


PANEL CUTOUT RECOMMENDATION

Thickness 1.6 mm → 3 mm



Version 84 405 04X



GROUND FAULT & ARC FAULT CIRCUIT BREAKER

GF-AFCB 115/200 VAC 360 .. 800 HZ



Read also p. 8-11

REFERENCES

Rating	GF-AFCB**	Three pole AFCB	Single pole AFCB	Software + Breaker reader
1 A				
3 A	84 411 136	84 411 103	84 401 503	
5 A	84 411 137	84 411 105	84 401 505	
7.5 A	84 411 138	84 411 107	84 401 507	
10 A	84 411 139	84 411 110	84 401 510	
15 A	84 411 140	84 411 115	84 401 515	
20 A	84 411 141	84 411 120	84 401 520	
25 A	84 411 142	84 411 125	84 401 525	

Accessories: breaker reader + CD

84 411 101

** on request the GFCB is available in star or triangle configuration with different thresholds

Mounting hardware

Threaded barrel	M12-0.75			
M12-100		•	•	•
7/16				
Terminal Screw	8-32 UNC	•	•	•
M4				

Button color

Green			•	
Black	•	•		

Conformity standard

EN 2592 - EN 2996*	•	•		
EN 2495*			•	
AS 5692	•	•	•	

* for thermal part

Mass / MTBF / Technical file

Without mounting hardware	< 141	< 141	< 31	
With mounting hardware	< 150	< 150	< 33	
MTBF FH (Typical)	> 150 000	> 150 000	> 450 000	

GENERAL CHARACTERISTICS

Electrical

Breaking current 1CO + 2OCO	115/200 VAC (400 Hz)	
Dielectric	2000 A	
Endurance cycles	1500 V	
Insulation resistance	5000 (with cos fi: 0.7)	
Working life (endurance) at 5° RC	above 100 MΩ	
Auxiliary contact current	50 cycles	
Voltage drop compliance	0.1..0.2 A	
	MS14154/AS14154A/EN2592/2996/3774	

Mechanical

Operating force	8N<push<80N	5N<pull<30N
Endurance	no load	5 000 cycles
	on resistive load	5 000 cycles
Tightening torque (barrel nut)	recommended: 4 N.m ; Max.: 5 N.m	
Tightening torque (terminal screw)	1.7 N.m +/-0.1	

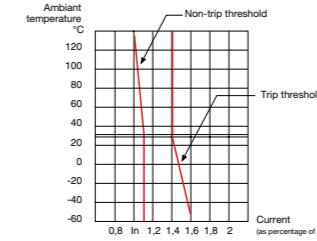
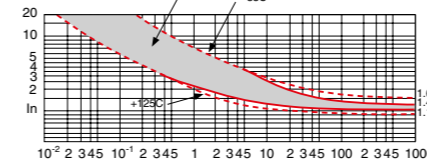
Environmental

Salt spray	According DO160 section 14 category B
Humidity	According DO160 section 6 category B
Operating temperature (1 to 15 A)	-60°C +125°C
Operating temperature (20 and 25 A)	-60°C +90°C
Operating temperature (Arc fault and ground fault detection)	-40°C +71°C
Acceleration (centrifugal)	17g
Shock	up to 50 g (11 ms) -1/2 sine
Vibration (sinusoidal)	10 g-PK from 5 to 2000 Hz
Vibration (random at RC)	5.82 Grms from 10 to 2000 Hz

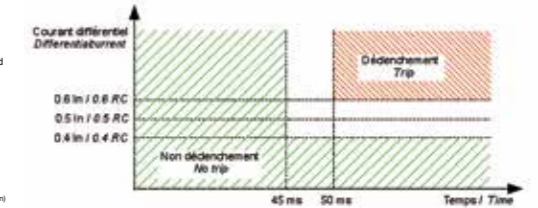
CURVES

Thermal trip

Trip times envelope for temperature from -60°C to 125°C (direct overload)

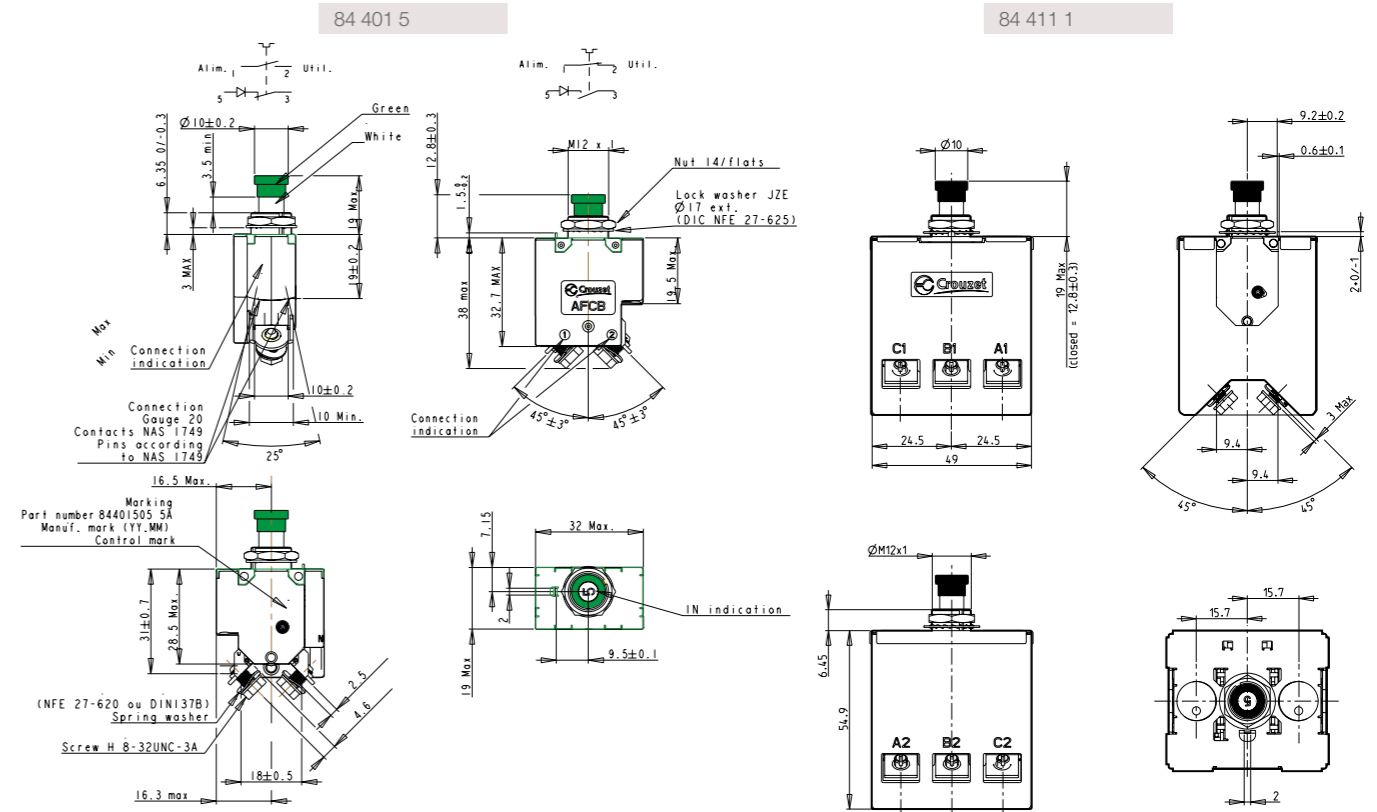


Ground fault trip thresholds



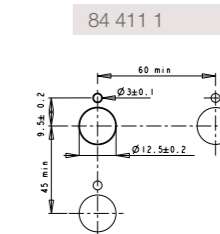
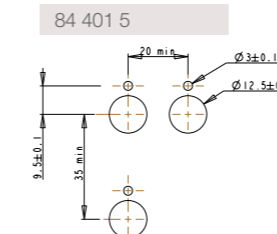
Arc fault trip: Compliant with AS5692

DIMENSIONS



PANEL CUTOUT RECOMMENDATION

Thickness 1.6 mm → 2.4 mm



DUMMY CIRCUIT BREAKER

DUMMY & WATERTIGHT PUSH PULL CB



84 404 001 84 404 011 84 404 004 84 411 860 84 313 626 84 404 007

CHOICE BY CIRCUIT BREAKER SIZE

Small Model Single Pole DPMU										
Initial Family	Signal contact	Ref.	Conformity	Barrel threadings			Terminal screw		Control button	Technical file
				M12-0.75	M12-100	7/16	H8-32	M4		
Reset button	Yes	84 404 001	ABS0064						Active	
84 401 0xx	Yes	84 404 002	E0486A01						Pushed in	SP4361
84 405 0xx (push-push)	No	84 404 003							Without	SP4362
84 400 0xx (MS3320)	No	84 404 004							Pushed in	SP4365
84 402 0xx	No	84 404 005							Pushed in	SP4369
84 401 8xx	Yes	84 404 006	E0486B01						Without	
Frog legs	No	84 404 009					6-32UNC2A		Without	SP9903
Frog legs	Yes	84 404 010					6-32UNC2A		Without	SP9904
84 402 0xx	No	84 404 011							Pushed in	SP9910
Frog legs	Yes	84 404 013							Without	SP9914
84 401 6xx	Yes	84 404 015	E0486B05						Without	

Small Model Three Pole DPMT										
Initial Family	Signal contact	Ref.	Conformity	Barrel threadings			Terminal screw		Control button	Technical file
				M12-0.75	M12-100	7/16	H8-32	M4		
84 411 8xx	Yes	84 404 007	E0486B03						Without	
84 411 860	Yes	84 411 860	E0486A03						Pushed in	

Big Model Single Pole DGMU										
Initial Family	Signal contact	Ref.	Conformity	Barrel threadings			Terminal screw		Control button	Technical file
				M12-0.75	M12-100	7/16	H8-32	M4		
84 306 65x	Yes	84 404 016	E0486B06							

Big Model Three Pole DGMT										
Initial Family	Signal contact	Ref.	Conformity	Barrel threadings			Terminal screw		Control button	Technical file
				M12-0.75	M12-100	7/16	H8-32	M4		
84 313 6xx	Yes	84 313 626	E0486A04						Pushed in	SP4347
84 313 0xx	No	84 313 044							Pushed in	SP4335
84 313 6xx	YES	84 404 014	E0486B04						Without	

CHOICE BY STANDARD

ASNE0486	EN4728	Corresponding functional Circuit Breaker	Model code	Dimension & Alt Hardware	Part-number
E0486B01	EN4728B01C	EN2995-004	B (no control button)	01 C	84 404 006
E0486B03	EN4728B03C	EN2996-004	B (no control button)	03 C	84 404 007
E0486B04	EN4728B04C	EN3672-006	B (no control button)	04 C	84 404 014
E0486B05	EN4728B05C	EN2995-005	B (no control button)	05* C	84 404 015
E0486B06	EN4728B06C	EN3661-006	B (no control button)	06 C	84 404 016

* No power terminals

› To understand attachment hardware codification, please see page 19.

DIMENSIONS

84 404 001

84 404 006

84 404 011

PANEL CUTOUT RECOMMENDATION

› Thickness 1.6 mm → 3 mm

Please, refer to the according technical file

Watertight according to MIL PRF8805-E

Cockpit overhead panel

When button is pulled out, calculator is RESET

10 mA

Due to the upside down position of the CB and watertightness, there is no water ingress even with condensation

ACCESSORIES

ACCESSORIES

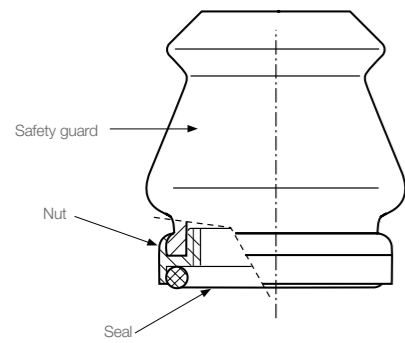


REFERENCES

Rating	Gag	Caps	Covers	Auxiliary contact pin
red gag	23 422 009			
grey cap	panel hole diam 12.5mm	24 323 003		
brown cap	panel hole diam 12.5mm	24 323 005		
opaque covers	Barrel M12*1		79 254 157	
	Barrel M12*0.75		79 254 154	
	Barrel 15/32		79 254 155	
	Barrel 7/16		79 254 156	
clear covers (see through)	Barrel M12*1		79 254 150	
	Barrel M12*0.75		79 254 151	
	Barrel 15/32		79 254 152	
male pin	EN 3155 -016M 2018			25 637 611
Other information				
crimping tool for pin 25637611:		crimp tool: M22520/1-01 and crimp locator: M22520/1-02		
insertion extraction tool:		Ref. Deutsch: 020-0008-20		
male pin		Ref. Deutsch: 006-0912-20		
Conformity Standard				
IP66 & 67				
VG 95345 chap. 23				

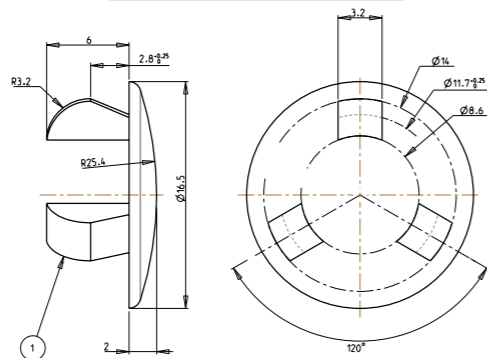
DIMENSIONS

79 254 -150 to -157



Caution: For good water proofness: the CB pannel must be 2.5 mm thick and positioning key hole must be «blind». Torque of 4 N.m must be applied to the nut ; not on the cover.

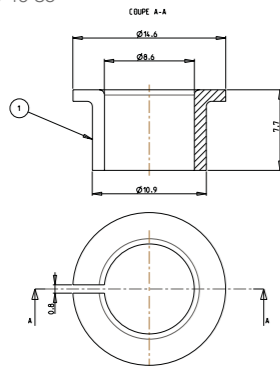
24 323 003 24 323 005



ECHELLE 1/1

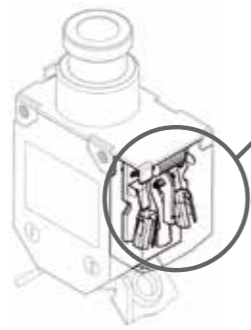
23 422 009

EC 79 25 40 85



ECHELLE 1/1

25 637 611



Connector pins for auxiliary contacts:
EN 3155 - 016 M2018
Wire gage: 18 to 24 (0.21 to 0.93mm²)

ELECTRICAL DISTRIBUTION

WIRE & LOAD PROTECTION

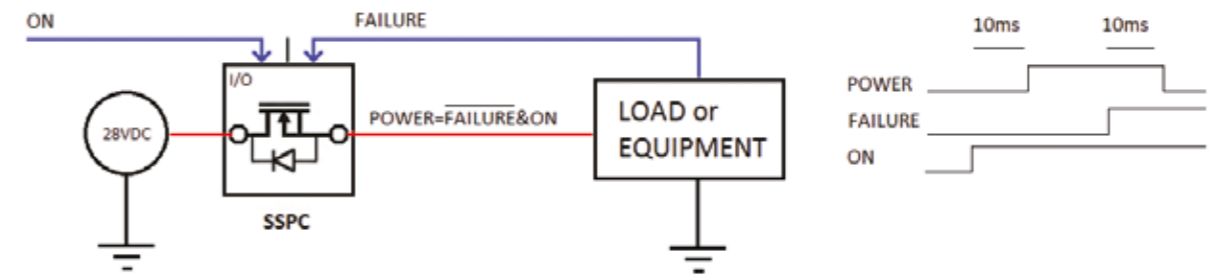
Crouzet is proud to contribute towards the “greener Aircraft” through its bus connected components and through its never ending quest for more compact and lighter solutions.

Crouzet delivers 3 standard distribution components:

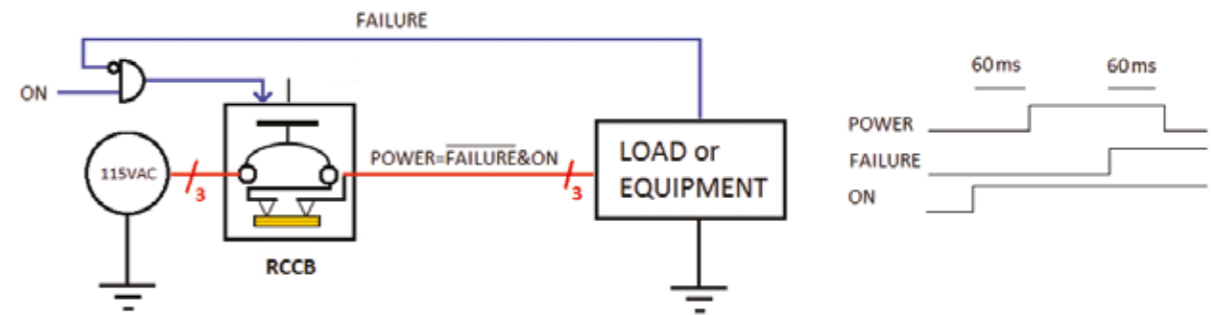
- › RCCB
- › A Circuit Breaker panel Kit
- › Solid State Circuit Breakers

With smart management, loads can be powered off during some flight phases and in rush current can be reduced. This technique will decrease the electrical network complexity and weight. Using information provided by the load, SSCB and RCCB's role can encompass wire protection and load protection

LOAD AND WIRE PROTECTION WITH SSPC

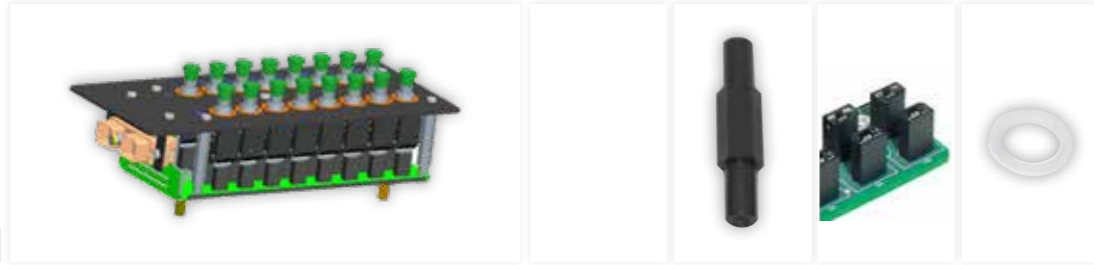


LOAD AND WIRE PROTECTION WITH RCCB



CIRCUIT BREAKER PANEL KIT

PANEL KIT FOR PUSH-FIT 6.3 MM BLADE CB



Read also page 15

REFERENCES

	complete panel	PCB	Right angle 90°	Spacers	Straight 180°
complete panel large	84 341 641				
complete panel small	84 341 640				
spacer				79 219 431	
receptacle					25 579 113
centring grommet			Air LB		79 219 333
EN 4165 connector support				79 219 440	
PWB with 32 receptacles		79 219 439			
front plate				79 219 441/42	

Spacer kit	
5 spacers	
16 grommets	79 219 443
32 receptacles	

Connection possibilities	
EN4165 (2 modules of 8 size 16 pins) with pins soldered on the vertical PCB	
EN4165 (2 modules of 8 size 16 pins) held by 79219440 with crimped contact pins	
Flying leads soldered on the vertical PCB	

Circuit Breaker type	
Faston without auxiliary contact	84 408 0xx
Faston with auxiliary contact non polarised	84 408 8xx
Faston with auxiliary contact polarised	84 408 6xx

Weight (g)	
Without standard CB (only mechanical panel)	< 351
Panel with 16 Circuit Breakers	< 528
MTBF FH (Typical)	> 60 000

GENERAL CHARACTERISTICS

Electrical		
Vehiculated current	15*4+6*10+6*5=150 A	from -60°C to 71°C
Vehiculated power	150*28=4200 W	
Prospective current (blocked mechanism)	1800 A	28 VDC (no copper tracks destruction)
Dielectric	500 VDC between 2 copper tracs and between each track and power feeder	

Mechanical	
	torque (max) N.m
Power stud (M6)	3.9
Every screw/spacer (M3)	2
Locktite	on every screw/spacer (not on power stud nut)

Environmental			
DO160 section	Test	category	method
4	Altitude		similarity
5	Temperature	from -60°C..71°C (with power)	test
6	Humidity		test
7	Crash	MIL STD 810E	test
		80 ms 1/2 sine (20 g on all axes)	
8	Vibration	MIL STD 810E helicopter	test
		random wide band+ sine strips	
9	Explosion proofness		demonstration
10	Waterproof		N/A
11	Fluids		N/A
12	Sand and dust		similarity
13	Fungus resistance		no tested
14	Salt spray	48h no power + 48h dry	test
15	Magnetic effect		demonstration
16 → 23	EMI		N/A
25	Inflammability	FAR 25853	demonstration

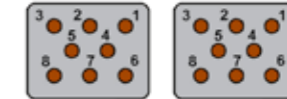
HOW DOES IT WORK?

The assembly is qualified and distributes securely up to 150 A under 71°C with a configuration carrying four 15 A, six 10 A and six 5 A Circuit Breakers (thus a total of 16 CBs). The distribution connector can be mounted on the vertical PCB or distribution leads can be soldered on the vertical PCB.

› If leads are soldered directly on the vertical PCB, the maximum currents are:
 Red zone: 15 A max
 Yellow zone: 10 A max
 Green zone: 5 A max

Max output:
 $4*15+6*10+6*5=150\text{ A}$

› If EN 4165 is soldered and used with leads the size 16 pins limit the current to 13 A:

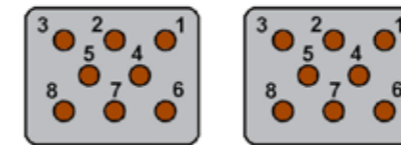


Max output:
 $4*13+6*10+6*5=142\text{ A}$

PIN TO CB AFFECTATIONS

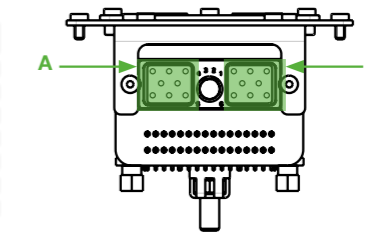
EN4165

Layout 0816: 8 contacts size 16 x 2



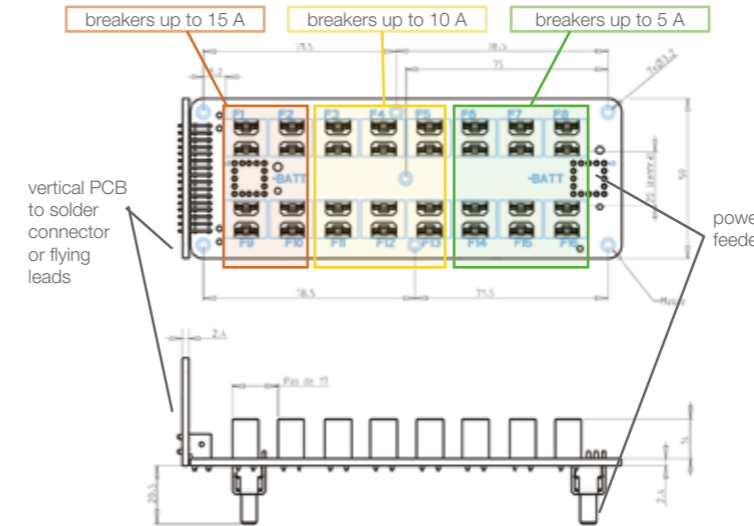
Module A	CB#
1	F6
2	F2
3	F1
4	F7
5	F3
6	F8
7	F5
8	F4

connector EN 4165 8T16

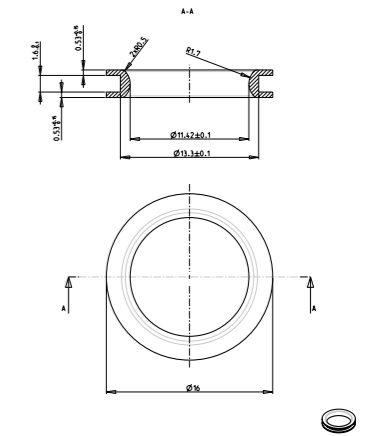


Module B	CB#
1	F9
2	F10
3	F14
4	F11
5	F15
6	F12
7	F13
8	F16

DIMENSIONS AND SPECIFIC ZONES FOR CB RATINGS

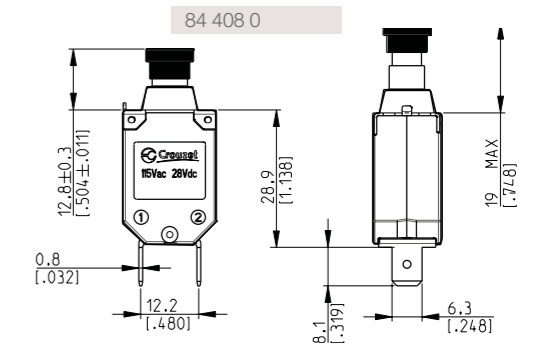
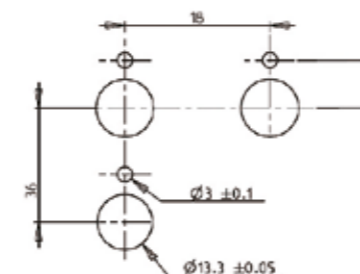


CENTRING GROMMET



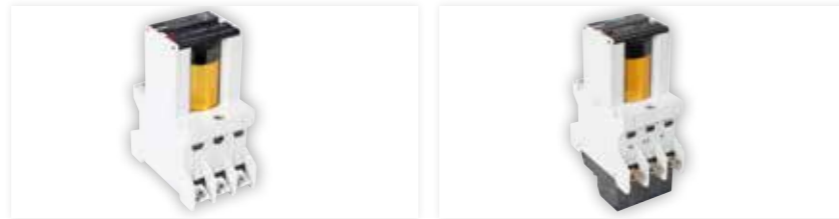
PANEL CUTOUT RECOMMENDATION FOR CB 84 408 XXX FAMILY

› Required panel thickness for centring grommet 79219333: 1.6 mm



REMOTE CONTROL CONTACTOR & CIRCUIT BREAKER

RCCB 115/200 VAC 360-800 HZ



Read also page 16

REFERENCES

Rating	Without current transformer	With current transformer
35 A	84 354 335	84 354 435
50 A	84 354 350	84 354 450
60 A	84 354 360	84 354 460

GENERAL CHARACTERISTICS

Mounting hardware		
Fixing screws (to panel or closet wall)	3 screws 10-32 UNF-3B	3 screws 10-32 UNF-3B
Connexion screws (to power feeders lugs)	6 screws 8-32 UNC-3A	6 screws 8-32 UNC-3A
Matched connector for control signals	Air LB00 1748-120.00	Sub D 15 Female
Connector retaining screw	M3x0.5	-

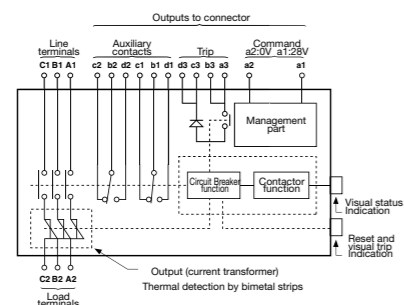
Contactor Function		
Actuating voltage	17 V= ≤U _s ≤32 V (a2 - a1 pins)	17 V= ≤U _s ≤32 V (10 - 2 pins)
Max Pull-in current	3A during max 50 ms	3A during max 50 ms
Max. continuous hold-in current	300 mA	300 mA
Min. Hold-in voltage	10 V=	10 V=
Response time (off to on)	< 60 ms	< 60 ms
Release time (on to off)	< 60 ms	< 50 ms
Direct visual indication of contacts position on front plate	OPEN / CLOSE	OPEN / CLOSE
Auxiliary contact n°1 SPDT type Intermediate current level	Common/NC/NO: b1/c1/d1 28 VDC 3A (L/R 5 ms) - 5 VAC 250 mA	Common/NC/NO: 3/4/5 28 VDC 3A (L/R 5 ms) - 5 VAC 250 mA
Auxiliary contact n°2 SPDT type Low level current	Common/NC/NO: b2/c2/d2 3 VDC 0 to 20 mA resistive 28 VDC 200 mA (L/R 5 ms)	Common/NC/NO: 6/7/8 3 VDC 0 to 20 mA resistive 28 VDC 200 mA (L/R 5 ms)
Dielectric strength	I leakage < 1 mA @ 1500 V-	I leakage < 1 mA @ 1500 V-
Insulation resistance	≥ 100 MΩ	≥ 100 MΩ
Contactor Endurance cycles with RC at 40°C cos Fi=0.7	100 000 cycles	100 000 cycles

Current measurement & Breaker function		
Current transformer ratio	-	0.5 Volt rms for 10 A rms
Integrated load resistance (on current transformer output)	-	50 Ω
Breaking at 115 VAC 360-800 Hz	2000 A	2000 A
Trip status auxiliary contact (incorporated diode)	28 VDC 10 to 200 mA	28 VDC 10 to 200 mA
Visual indication of trip status by R button on front plate	Yes	Yes
Operating circuit disable after break	Yes	Yes
Resetting after trip	By push on front R button	By push on front R button
Endurance at 2*RC	1 000 cycles	1 000 cycles

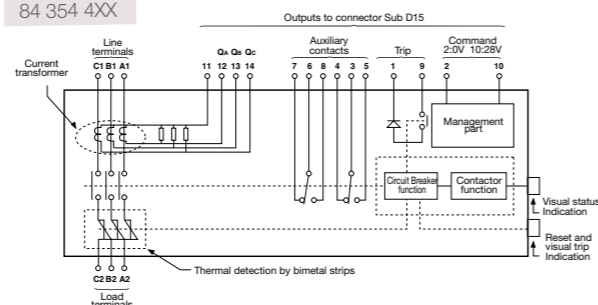
Mechanical		
Operating force (R push button)	< 10 N	< 10 N
Max. admissible force (R push button)	50 N	50 N
Tightening torque (barrel nut)	3 +/- 0.2 Nm	3 +/- 0.2 Nm
Tightening torque (terminal screw)	2.3 +/- 0.1 Nm	2.3 +/- 0.1 Nm
Weight	< 550 g	< 700 g
MTBF FH (Typical)	> 300 000	> 300 000

Environmental		
Salt spray	48h at 5% NaCl	48h at 5% NaCl
Operating temperature	-40°C to +85°C	-40°C to +85°C
Acceleration (centrifugal)	up to 10 g	up to 10 g
Shock	25 g - 11 ms	25 g - 11 ms
Vibration (sinusoidal)	10 g from 5 to 2000 Hz	10 g from 5 to 2000 Hz
Vibration (random)	5.8 g from 10 to 2000 Hz	5.8 g from 10 to 2000 Hz

84 354 3XX



84 354 4XX



HOW DOES IT WORK?

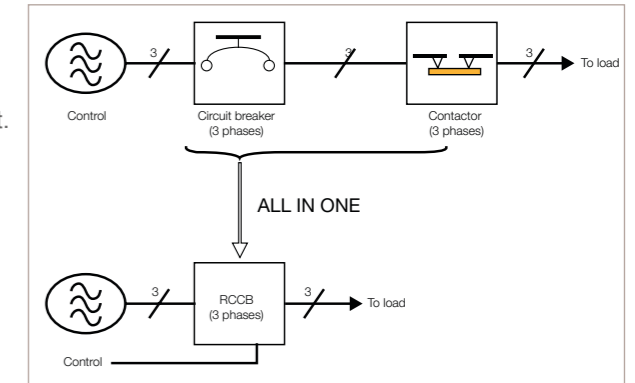
The RCCB merges a contactor function and a circuit breaker function in a single unit. This association gives the following unique advantages:

- › Reduction of the length of generally large cross-sections wires (mass reduction and harness simplification)
- › Reduction of voltage drop (reduced number of contacts)
- › Reduction of envelope
- › Improved reliability (less components)

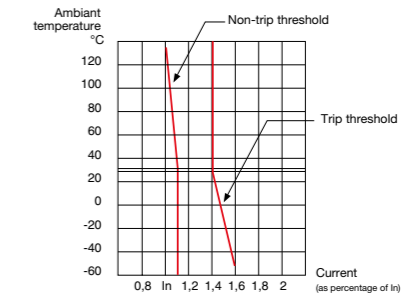
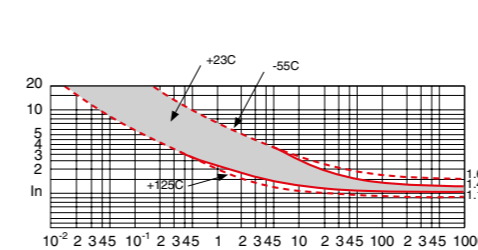
The contactor is closed when 28 V is applied on the command input.

The RCCB has a status display window and a mechanical «TRIP indicator». When the CB has tripped, the mechanical «TRIP indicator» is «popped out» and must be pushed back in manually to RESET the circuit breaker (see page 16).

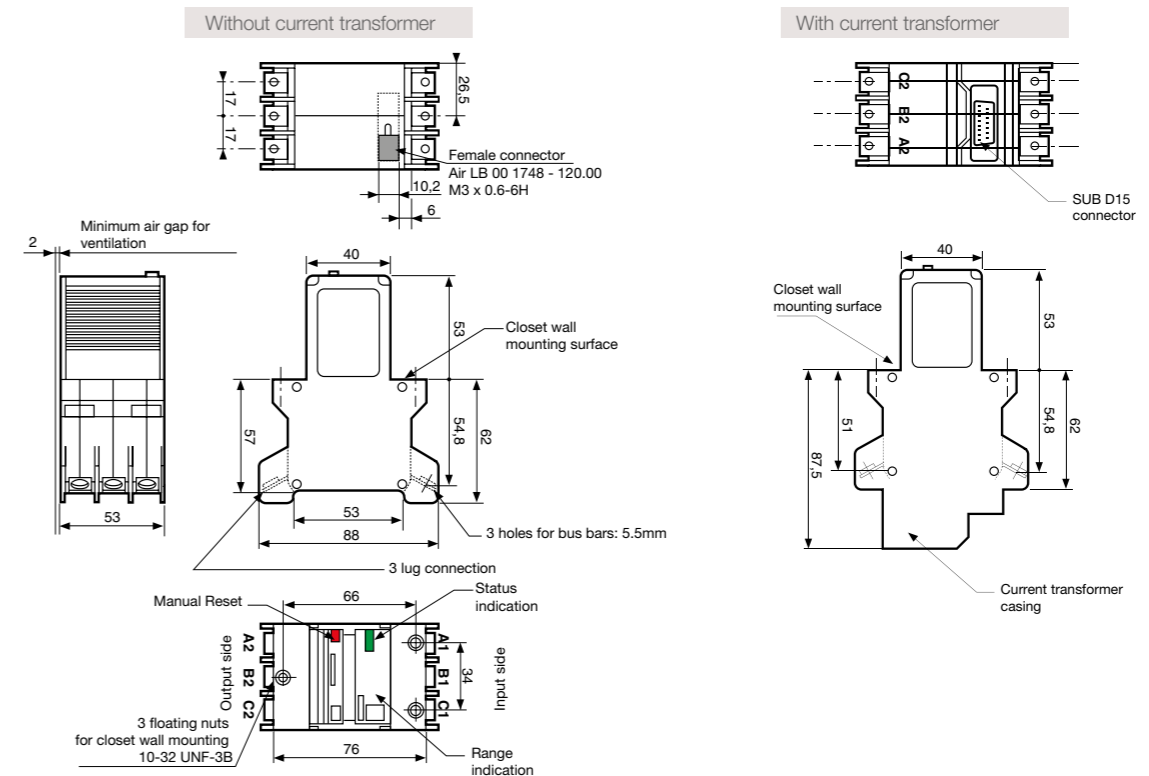
The «protection function» overrides the «contactor function». After tripping, the RCCB must therefore be reset manually, this avoids any risk of spurious restarting.



TRIPPING CHARACTERISTICS



DIMENSIONS



AMERICAS
CANADA

Tel.: +1 (855) 929-5465
americas.custserv@crouzet.com

MEXICO

Tel.: +1 (855) 929-5465
americas.custserv@crouzet.com

USA

+1 (855) 929-5465
americas.custserv@crouzet.com

COUNTRIES NOT LISTED

+1 (855) 929-5465
americas.custserv@crouzet.com

EUROPE / MIDDLE EAST / AFRICA
BELGIUM

Tel.: +32 (0) 2 620 06 05
Fax: +32 (0) 2 461 00 23
klantenservice@crouzet.com

FRANCE

Tel.: +33 (0) 475 802 101
Fax: +33 (0) 475 828 900
relationclient@crouzet.com

GERMANY / AUSTRIA

Tel.: +49 (0) 2103/9385930
Fax: +49 (0) 2103/980-222
kundenservice@crouzet.com

ITALY

Tel.: +39 (02) 38 594 099
Fax: +39 (02) 82 952 104
assistenzaclienti@crouzet.com

SPAIN / PORTUGAL

Tel.: +34 (91) 215 80 95
Fax: +34 (93) 2 20 02 05
atencionalcliente@crouzet.com

SWITZERLAND

Tel.: +41 (0) 225 67 57 90
Fax: +41 (0) 565 88 02 75
kundenservice@crouzet.com

THE NETHERLANDS

Tel.: +31 (0) 20-654 52 20
klantenservice@crouzet.com

UNITED KINGDOM

Tel.: +44 (0) 2076 600 025
customer.relation@crouzet.com

COUNTRIES NOT LISTED

Tel.: +33 (0) 475 802 102
Fax: +33 (0) 475 828 900
customer.relation@crouzet.com

ASIA / PACIFIC
CHINA

Tel.: +86 (75) 2 5303 200
china@crouzet.com

INDIA

india@crouzet.com

SOUTH KOREA

Tel.: +82 (2) 2679 8312
Fax: +82 (2) 2679 9888
korea@crouzet.com

EAST ASIA PACIFIC

Tel.: +86 (21) 8025 7177
Fax: +86 (21) 6107 1771
eap@crouzet.com

Warning:

The product information contained in this catalogue is given purely as information and does not constitute a representation, warranty or any form of contractual commitment. Crouzet and its subsidiaries reserve the right to modify their products without notice. It is imperative that we should be consulted over any particular use or application of our products and it is the responsibility of the buyer to establish, particularly through all the appropriate tests, that the product is suitable for the use or application. Under no circumstances will our warranty apply, nor shall we be held responsible for any application (such as any modification, addition, deletion, use in conjunction with other electrical or electronic components, circuits or assemblies, or any other unsuitable material or substance) which has not been expressly agreed by us prior to the sale of our products.